RAILROAD GAZETTE

SATURDAY, SEPTEMBER 12, 1874.

CATECHISM OF THE LOCOMOTIVE.

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PART XXV.—CONTINUED.

OPERATION AND MANAGEMENT OF LOCOMOTIVES.

QUESTION 459. *What other parts of a locomotive should be examined before starting?*

Answer. It should be certain that the brakes on the tender are in good working condition, that is, that the bolts, nuts and keys are all secure, the levers, rods and chains properly connected, and the shoes fastened and not too much worn. If either an atmospheric or vacuum brake is used, it should be tested before starting to see that the pump or ejector is in good working condition. It is also well to apply the brakes to the train before starting, so as to see whether the connections are in good condition and properly connected. It is always best for the locomotive runner to examine the connections of the brake hose through the whole train himself, to be sure that they are properly made.

The inside of the tank should also be examined occasionally, to see whether it is clean, and if not it should be thoroughly washed out. The man-hole should always be covered before starting in order to prevent cinders and coal from falling in, which are liable to obstruct the pump valves. It is hardly necessary to say that it must always be certain before starting that there is enough water in the tank to feed the boiler until the next point is reached at which a supply can be obtained. The sand-box must also be filled, the bell rope in good condition, and if running at night the reflector of the head-light must be cleaned and the lamp supplied with oil and the wick trimmed so as to burn brilliantly. The locomotive runner must also see that the proper signals are displayed in front of his engine.

QUESTION 460. *What tools, etc., should every locomotive running on the road carry?*

Answer. A coal shovel, coal pick, long-handled hoe* and poker, a pair of jacks, either screw or hydraulic, chains, rope and twine to be used in case of accident, a heavy pinch-bar for moving the engine, a small crow-bar, oil-cans with short and long spouts and another smaller one with spring bottom, a steel and a copper hammer, a cold and a cape chisel, a hand-saw, axe and hatchet, two monkey wrenches, one large and one small, and a full assortment of solid wrenches for the bolts and nuts of the engine, cast-iron plugs for plugging tubes, with a bar for inserting them, two sheet-iron pails or buckets, different colored lanterns and flags, according to the colors used for signals on the line, and a box with a half-dozen torpedoes.

QUESTION 461. *What duplicate parts should be carried with the engine?*

Answer. Keys, bolts and nuts for connecting-rods, split-keys, wedge bolts, bolts for oil-cellars of driving and truck boxes, driving and truck spring-hangers, wooden blocks for fastening guides in case of accident, blocks for driving-boxes and links, a half-dozen ¾ in. bolts from six inches to two feet long to be used in case of accident, two extra water-gauge glasses, two glass head-light chimneys.

QUESTION 462. *What should be observed in lubricating a locomotive or any other machinery?*

Answer. The most important thing to observe is that the oil reaches the surface to be lubricated. It is of much greater importance that the lubricant should reach the right place than that a large quantity should be used. A few drops carefully introduced on a journal will do much more good than a large quantity poured on the part carelessly. For this reason all oil-cups and oil-holes should be kept clean so as to form a free passage for the oil.

PART XXVI.

MANAGEMENT OF LOCOMOTIVES.

QUESTION 463. *Before starting the fire in a locomotive, what must be observed?*

Answer. It must always be noticed, before kindling the fire, whether the boiler has the requisite quantity of water in it; that all cinders, clinkers and ashes are removed from the grates and ash-pan; that the grates and drop-door are properly fastened, and that the throttle-valve is closed and the lever secured. Locomotive boilers are sometimes seriously injured by building a fire in them when there is no water in the boiler. In filling a boiler it must be remembered, however, that when the water is heated it will expand, and that when bubbles of steam are formed they will mix with the water and thus increase its volume, so that after the water is heated its surface will be considerably higher than when it is cold.

QUESTION 464. *How should the fire in a locomotive be started?*

Answer. It should be started very slowly, so as not to heat any one part suddenly. Probably the greatest strains which a locomotive boiler has to bear are those due to the unequal expansion and contraction of its different parts. When the fire is started, of course, the parts exposed to it are heated first, and consequently expand before the others. Now if the fire is kindled rapidly, the heating surfaces will become very hot before the heat is communicated to the parts not exposed to the fire. Thus the tubes, for example, will be expanded so as to be considerably longer than the outside shell of the boiler, and therefore there will be a severe strain on the tube-plates, which will be communicated to the fire-box, stay-bolts, braces, etc. The inside plates of the fire-box will also become much hotter than those on the outside, and as it is rigidly fastened to the bar to which both the inside and the outside shells are fastened at the bottom, its expansion will all be upward, which thus strains the stay-bolts in that direction. As the motion due to this expansion is greatest near the top of the fire-box, the top stay-bolts are of course strained the most, and it is those in that position, as has already been pointed out, which are the most liable to break. When steel plates are used the expansion or contraction often cracks them, and sometimes, hours after the fire is withdrawn from the fire-box, the inside plates will crack with a report like that of a pistol. It is therefore very important both to heat and cool a locomotive boiler very slowly, and the fire should always be kindled several hours before the engine starts on its run.

QUESTION 465. *What should be done when the locomotive leaves the engine house and before the train is started?*

Answer. Before leaving the engine house the cylinder cocks should be opened, so that all the water or steam which is condensed in warming the cylinders can escape. Before the engine is started from the engine house the bell should be rung and time enough allowed for any workman employed about the engine to get out of the way. This rule must be scrupulously obeyed under *all circumstances*, and a locomotive should *never* be started without first giving such a signal. Without it there is always danger that some one about the engine will be hurt or killed. While running from the engine house to the train the runner should observe very carefully the working of all the parts of his engine, and as far as possible see that they are in good working condition. The fireman should stay on the tender to handle the brake, as may be necessary, and should assist in coupling the tender to the first car of the train. The junction with the train, especially when it is a passenger train, should be made very gently, as otherwise passengers may be injured by the shock. Before starting the runner should see *himself* that the engine and tender are securely coupled together, and the latter to the train, that the frictional parts are properly lubricated, as explained heretofore, that the fire is in good condition and that the requisite quantity of steam has been generated. If the steam is too low, the blower* is started, which stimulates the fire.

QUESTION 466. *When the train is ready, how should the engine be started?*

Answer. After the signal to start is given by the conductor the runner also gives a signal by either ringing the bell or blowing the whistle. The latter should, however, be used as little as possible, on account of the risk of frightening horses and the shock which it produces on persons who are unaccustomed to hearing it, or are suffering from any nervous disorder. After giving the requisite signal, the runner places the reverse-lever so that the valve will work either in full gear or very near it. He then opens the throttle *slowly* and *cautiously* so as to start the train gradually. If the train is a very heavy one, it is best to back the engine just so as to "take up the slack of the train," that is, to push the cars together so that there will be no space between them and thus compress the car draw springs. When the cars stand in this way, those at the front end of the train are started one after another, which makes the start easier than it would be if it were necessary to start them all at once. If the throttle is opened too rapidly, the driving-wheels are apt to slip, but with a very heavy train, even with the greatest care, this is liable to occur. If the train cannot be started otherwise, the rails must be sanded by opening the valves in the sand-box. As little sand should be used as possible, because the resistance of cars running on sanded rails is greater than on clean rails, and thus the train is more difficult to draw after it reaches the rails to which sand has been applied. Thus the difficulty to be overcome may be increased by the means employed to overcome it.

While the train is slowly set in motion the fireman and runner must ascertain by watching whether the whole train moves together, and that none of the couplings are broken in starting, and also whether any signal is given to stop, as is sometimes necessary after the train has started. On leaving the station he should observe whether all the signals indicate that the track is clear and that the switches are set right, and also look out for obstructions on the track. The train should always be run slowly and cautiously until it has passed all the frogs, switches and crossings of the station yard, and not until then and when the runner has seen that everything is in order should he run at full speed. As the engine gains in speed the reverse lever should be thrown back and nearer the center of the quadrant or sector, so as to cut off "shorter."

QUESTION 467. *After the engine is started, how can it be run most economically?*

Answer. The advantage of using steam expansively has already been explained in Part V.; it is more economical to use steam of a high pressure, which is done by keeping the throttle-valve wide open, and then regulating the speed by cutting off shorter—that is, expanding it more. If the speed is reduced by partly closing the throttle-valve, the steam is wire-drawn and, as was shown in answer to Question 58, it then produces much less useful effect than it would if it was admitted into the cylinder at full boiler pressure.

It is found, however, that in many cases if the steam is cut off very short the final pressure when it escapes is so low that it does not produce blast enough to stimulate the fire, and therefore the boiler will not make enough steam.* This is more liable to occur with engines which have small than with those which have large boilers, or when the boilers are in bad condition or the fuel is of poor quality. When it does occur it is necessary to work steam during a longer portion of the stroke and to throttle it somewhat so as to increase the final pressure when it is exhausted. Of course this is very wasteful, but it is often the best which can be done and pull the train.

There is also another practical difficulty in using steam of a high pressure and running with the throttle wide open and regulating the speed with the reverse lever alone. The link motion, as has already been explained, will not be effective in cutting off at a point below about one-quarter of the stroke. Now it often happens, even when cutting off at that short point, with light trains on a level or slightly descending grade, that the speed will be too great if the throttle is wide open and with full steam pressure in the boiler. When this is the case, it is absolutely necessary to reduce the speed either by partly closing the throttle, or reducing the pressure in the boiler. Undoubtedly if valve-gear for locomotives was so constructed that steam could be cut off effectively at a shorter point of the stroke, it would result in increased economy in the use of steam.

The runner should aim to run at as nearly uniform speed as possible, and in order to do so should divide the distance between stopping points and the time given for running it into as small divisions as he conveniently can, so as to be able to tell as often as possible whether he is running too fast or too slow, and thus travel over the shorter spaces in corresponding periods of time.

QUESTION 468. *How should the boiler be fed?*

Answer. The feeding of the boiler should if possible be continuous, and the quantity of water pumped into it should be adjusted to the amount of work which the engine is doing. Ordinarily one pump is more than sufficient for feeding the boiler, so that usually only the one on the right side of the engine, where the runner stands, is used. The flow of the water is regulated by partly opening or closing the feed-cock. The injector is commonly used only when the engine is standing still, when the pumps will not feed. In feeding the boiler it must be seen that the water is neither too high nor too low. If it is too low there will be danger of overheating the crown-plates or even of an explosion; if it is too high, the steam space in the boiler is diminished unnecessarily, and will cause the water to rise in the form of a spray, and thus be carried into the cylinders with the steam, or the boiler will *prime* or *foam*, as it is called. This water, if it collects in the cylinder as already explained, may by the concussion produced by the motion of the piston break the cylinder.

QUESTION 469. *What is the cause of priming in a boiler?*

Answer. It is often caused by the difference in temperature and pressure in the water below and the steam above. Thus, if we have a boiler in which the water is heated to a temperature due to 100 lbs. effective pressure, or 338 degrees, and we then open the throttle-valve suddenly, so as to relieve the pressure on top of the water, there will at once be a rapid generation of steam in the water, which will rush to fill the space from which the steam has been drawn. This newly generated steam will be formed at the hottest part of the boiler first, that is, next to the heating surface. It will therefore happen that as soon as the pressure is relieved, bubbles of steam from all parts of the heating surface of the boiler will flow to the point at which the steam escapes. The motion of these bubbles will be so rapid that large quantities of water will be carried with them. The same thing will also occur if the heat of the water is increased very rapidly. The water will then become hotter than the temperature due to the pressure of the steam above it, and consequently there will be a rapid formation and escape of bubbles of steam from the water, which will thus have the same effect as they would have if the steam pressure was reduced.

The amount of water carried up with the steam is increased if the escape of the latter is obstructed in any way, owing to imperfect circulation of water in the boiler, or by floating impurities, such as oil, on the surface. When this condition of things exists, the ebullition is, as it were, convulsive, and the water is thus carried up with the steam when it escapes. Priming is also probably due in some measure to the flow of steam over the surface of the water to the point of outflow,* carrying particles of water with it just as a high wind will, when blowing over the crests of the waves of the sea.

When steam is drawn, as it usually is in locomotives, from the top of the dome to which the safety-valves are attached, the tendency to prime is very much increased when they are blowing off, so that some engineers advocate the use of two domes, from both of which the supply of steam is sometimes drawn, and in other cases the safety-valves are mounted on one, and the steam-pipe is placed in another dome. Whenever the safety-valves begin blowing off steam, the pressure in the boiler should be reduced as soon as possible, not only because when they are blowing off it tends to produce priming, but because the steam which escapes from them is wasted. The pressure can be most economically reduced either by increasing the amount of water which is fed into the boiler, or by opening the heater cocks and allowing the steam to escape into the tank, and thus warm the water. If the boiler is too full, the former method cannot be employed, and in heating the water in the tank the runner must be careful not to get it too hot, because in that case neither the pumps nor the injectors will work satisfactorily, and the paint on the tenders is also liable to be blistered and destroyed by the heat. By feeling the tank with the hand it can soon be discovered whether the water is too hot. If the steam pressure cannot be reduced in any other way, the furnace door must be partly opened.

The use of muddy water will also sometimes cause a boiler to prime. It is probable that priming is sometimes due to the formation of foam on the surface of the water, and therefore all priming is often called foaming; whereas it is thought that often a boiler will prime when the water does not foam. More accurate information regarding the priming of boilers is, however, much needed, as many of the phenomena have thus far not been satisfactorily explained. The principle

* These are of course not needed on wood-burning engines.

* The blower is a pipe in the smoke box, which is directed up the chimney. Steam is admitted into this pipe, the escaping current of which produces a draft in a similar way to that caused by the exhaust steam.

* Wilson on Steam Boilers.

causes of priming in ordinary practice are, however, undoubtedly owing to defective circulation, to too little steam room, impure water, or too much water in the boiler.

QUESTION 470. *How can it be known whether an engine is priming, and what should be done to prevent it?*

Answer.—The priming of a boiler can be known by the white appearance of the steam which escapes from the smoke-stack and the cylinder cocks. Dry steam always has a bluish color. When an engine primes or works water into the cylinders, it is usually indicated by a peculiar dead sound of the exhaust, which from this cause loses its distinctly defined and sharp sound. This can be observed best when the furnace door is opened. It is also indicated by the discharge from the gauge-cocks, as the water which then escapes from the lower cocks is mixed with steam, or, as runners say, is not "solid," and the steam from the upper cocks is not clear, but mixed with water. To use a phrase employed by practical men, the priming or foaming of the boiler may be known by the "flutter" of the gauge cocks. As soon as there are any indications of priming, foaming, or that water is working into the cylinders, the cylinder cocks should be opened at once, otherwise the cylinders, cylinder-heads or pistons may be broken. The throttle-valve should be either partly or entirely closed. When the latter is done the foaming will in most cases cease for the time, so that the runner can tell how much solid water there is in the boiler. If he finds that the boiler has too much water in it, it is best to shut off the pumps, and in many cases the blow-off cock is opened. The latter is, however, attended with some danger, because if any obstruction should get into the blow-off cock, or it should stick fast, so that it could not be closed, all the water would escape from the boiler, and with a heavy fire in the fire box there would be great danger of overheating, and thus injuring the boiler or of "burning" it, as it is ordinarily termed.

A much better method of affording relief in such cases is to place what is called a *surface cock* in the back end of the fire-box, about half way between the upper and lower gauge-cocks. With such a cock the water can be blown off from the surface instead of from the bottom. As foaming or priming is often caused by oil or other floating impurities on the surface, they can be blown out of the boiler with this arrangement, whereas if the water escapes from the bottom of the boiler, the floating impurities will always remain after it is blown off. A perforated pipe, which extends for some distance along the surface of the water inside the boiler, is sometimes attached to the surface cock, so that the water which is blown off will be drawn from a number of points along the surface.

If the steam is rising rapidly when foaming begins, it will be well to cool the boiler off by opening the furnace door part way. This means of relief should, however, be used as little as possible, because there is always danger of causing the tubes or other parts of the boiler to leak, by either heating or cooling suddenly or rapidly. If the engine primes when there is but little water in the boiler, and at a time when the steam is rising rapidly, it may sometimes be remedied by increasing the amount of feed-water and thus partly cooling the water inside. The use of pure water, careful firing so as to keep the steam pressure regular, feeding the boiler so that the level of the water will be nearly uniform, and then starting the engine carefully, that is, opening the throttle-valve gradually, are the most effective means in practice of preventing a locomotive boiler from priming.

QUESTION 471. *What is the economical effect of priming on the consumption of fuel in locomotives?*

Answer. It causes a great waste of heat, first by the escape of that contained in the hot water which passes through the cylinders and which does no work, and second, when steam is mixed with a great deal of water it will not flow either to or from the cylinders as quickly or easily as dry steam will. Consequently the initial pressure on the piston, if the engine is running even moderately fast and is cutting off short, will not be so great as it would be if dry steam was used. Wet steam is also more difficult to exhaust from the cylinder than that which is dry, and therefore the back pressure on the piston is greater when the boiler primes than when dry steam alone is used.

QUESTION 272. *When running on the open road, what should the locomotive runner observe?*

Answer. Either he or the fireman should *constantly* watch the track in front of them, and also observe from time to time whether the train of cars, especially if it is a long one which he is handling, is in good condition. HE MUST OBSERVE EVERY SIGNAL SCRUPULOUSLY, AND SHOULD NEVER PASS ONE UNTIL HE IS SURE THAT HE IS AUTHORIZED TO DO SO. The well-known maxim "be sure you are right; then go ahead," should be changed for locomotive runners to, DON'T GO AHEAD UNTIL YOU ARE SURE YOU ARE RIGHT, and WHEN IN DOUBT ALWAYS CHOOSE THE SIDE OF SAFETY. In running through curves the speed of the train should always be moderated in proportion to the sharpness of the curve, and before reaching it. In running through curves the tendency of the train is to continue in a straight line, and there is thus danger of running off the track. The higher the speed of course the greater is the resistance which is required to prevent the train from running in a straight line, and consequently the greater is the strain which is thrown on the flanges of the wheels and on the rails and axles. In running through curves it is also impossible, usually, to see further than a short distance ahead, and therefore if the train is running very fast it will be impossible to stop it in time should there be any obstruction or danger on the track.

QUESTION 473. *What precautions should be observed in running over steep grades?*

Answer. On approaching an ascending grade the runner should see that the fire is in good condition, and as much coal should be put on it as can be burned to advantage. He should also fill the boiler as full of water as he safely can, without danger of priming, and should heat this water as hot as possible without blowing off steam at the safety-valves. The object of this is to have a supply of water already heated before reaching the grade. If, as often happens with a heavy train on a steep grade, the boiler will not make as much steam as the engine consumes, if there is a large supply of hot water in the boiler it can be used as a reserve, should it be necessary to do so, without danger of injury to the boiler. If there was so little water in the boiler that it would be dangerous to allow it to get lower, then it would be necessary to feed cold water as rapidly as the hot water escaped in the form of steam. It is often impossible to heat all this cold water as fast as it is pumped into the boiler, without reducing the the steam pressure until there is then not sufficient power to pull the train. If, however, there is a supply of hot water in the boiler, at the critical point on the grade, where the engine is most liable to fail, the pump can be partly shut off, and thus less water will be pumped into the boiler, and the steam pressure be maintained without danger. Undoubtedly it is better to feed locomotive boilers uniformly, if that is possible, but it often happens that a reserve supply of hot water in the boiler enables an engine to pull a train up the most difficult place, whereas without such a supply the locomotive would stick fast. As the capacity of locomotives is rated on nearly all roads by the number of cars they can "pull up the hill," of course whatever aids them at the critical point increases their capacity. It is this fact which gives engines with large boilers so much advantage over those with small ones.

In running up steep grades allowance should always be made for the effect of the inclination of the track upon the position of the water surface in the boiler, and also the fact that as soon as the throttle-valve is closed and steam shut off the surface of the water will be considerably lower than when the engine was working hard. On a grade of 50 feet to a mile the front end of the tubes of an ordinary locomotive would be about 1¾ in. higher than the back end of the crown sheet. If, then, on working hard up such a grade it is succeeded by another of equal descent, the front ends of the tubes would be 1¾ in. *lower* than they were while coming up, so that if the back end of the crown-sheet was covered with 1¾ in. of water just before reaching the top, it would be exposed to the fire as soon as the engine reached the descent. This exposure would be dangerous, because not only would the water be 1¾ in. lower over the crown-sheet, but it would fall considerably more when the throttle-valve was closed. These considerations will show the danger of running the water too low while ascending steep grades.

In pulling trains up steep grades especial caution should be exercised to prevent any of the cars from breaking loose from the train, because such an accident may cause great disaster.

As soon as the engine reaches the top of the grade the fireman should oil the main valves, because it can only be done when steam is shut off, as the oil will not run into the steam-chest when there is a pressure of steam in it; and as the valves are always subjected to the severest wear while pulling up a steep grade, the valves and valve-faces are apt to become dry. As saturated steam to some extent prevents valves from cutting, it is not so important that they be lubricated while the engine is working with steam, but as soon as steam is shut off they should be oiled, otherwise there is danger of their being injured by their friction on the valve-seats.

In running down grades the runner has the greatest possible cause for using every precaution, because not only is the train much more difficult to control, but usually frequent sharp curves prevent a view of the track for any considerable distance ahead. He should therefore watch the track in front of him with the greatest vigilance, so as to be ready to give the requisite signals to the brakemen to apply the brakes, or if the engine and train are provided with continuous brakes to apply the latter, or even reverse his engine in case of danger.

QUESTION 474. *How should an engine be run past those stations where the train does not stop?*

Answer. The speed of the train should be slackened in passing stations, especially if a clear view of the track and switch signals cannot be obtained at some distance before reaching the station. There is always a possibility that the switches may be turned wrong, or that there may be some obstruction on the track at stations, so that some caution should be exercised in running past them. The proper signal, either by the whistle * or the bell, should be given on approaching stations, and also at all common road crossings.

QUESTION 475. *What must be done on approaching a draw-bridge or a crossing of another railroad at the same level?*

Answer. In many of the States it is provided by law that all trains must come to a *dead stop* before crossing a draw-bridge or another railroad at the same level. Whether such a law exists or not the rule should always be observed. After coming to a stop the train should under no circumstances be started until the signal has been given to start the train by the signal-man at the bridge or crossing. A runner should *never assume* that the signal has been given, nor take another person's word for it, but should see and know it himself. In some conditions of the weather and with the light falling on a signal in certain directions, it is sometimes difficult to determine its color or form. If there is any doubt about it, the testimony of another person should always be sought. There is good reason for believing that color-blindness, that is, an incapacity for distinguishing one color from another, is a much more common infirmity than is usually supposed. It is certain, too, that people who ordinarily can distinguish colors very accurately are subject to color-blindness in certain conditions of health, and that it is sometimes the result of overwork or great weariness; and a case is recorded of a person who was always color-blind after a debauch. There is, therefore, good reasons why a locomotive runner should not place too implicit confidence in what he "sees with his own eyes," but if he has any doubt, he should take the "benefit of the doubt," which should always lead him to take the side of safety.

QUESTION 476. *How should the engine and train be managed in running into a station?*

Answer. First of all when running into a station when the train stops the speed must be checked so that the train will not enter with very great momentum. Therefore, at a distance varying from one to three-quarters of a mile, according to the nature of the grades and track, the steam should be shut off, so that the speed will be reduced so much that the train under any circumstances will be under full control. It is always better to enter a station at too low a speed than to run in too fast, because if it is necessary, more steam can always be admitted to the cylinders to increase the speed before coming to a stop, whereas it is not so easy to stop the train if it is running too fast, and it becomes necessary to check it before entering the station. This will sometimes be necessary because it may readily happen through negligence or accident at stations that in switching cars one or more may be left standing wholly or partly on the track, which the arriving train must run over, in which case a collision with its terrible consequences may be unavoidable.

When a trains is equipped with continuous brakes, the control which they usually give to a locomotive runner over the train is so great that he is apt to approach stations, crossings or draw-bridges at a high rate of speed, and rely on such brakes to stop the train. This practice is always attended with great danger, because if it was found on getting near to the station, crossing or draw-bridge that the track was not clear, and that it was obstructed by a car or train, or the draw was open, if the runner should attempt to apply the brakes and from some cause they should fail to work, as sometimes occurs, then a collision or other disaster would be inevitable, because it would be impossible to stop the train with the ordinary hand brakes. For this reason a locomotive runner should always approach such places cautiously and with his train under sufficient control, so that if he finds there is danger ahead he can stop the train with the ordinary means, or at the worst by reversing the engine. Continuous brakes should always, excepting in cases of imminent danger, be applied gradually, so as not to check the cars with a jerk or too suddenly. The practice of opening the cock which admits air to atmospheric brakes suddenly, and then turning it back again as quickly, is almost sure to produce disagreeable and dangerous shocks to the cars. The cock should be opened gradually, so as to check the cars slowly at first.

QUESTION 477. *What must be attended to when running a locomotive at night?*

Answer. As soon as it begins to grow dark, the headlight must be lighted and properly trimmed, and the proper lamp signals placed in front of the engine, if the rules of the road require the display of such signals. A lamp should always be placed in the cab, so as to throw its light on the steam-gauge, but not into the runner's face, because he is unable to see distant signals so well if his eyes are exposed to the glare of a light near him.

At night, as objects which are passed cannot be seen distinctly, it is more difficult to tell the speed at which an engine is running than it is in the day time. A runner should therefore consult his watch frequently, and by counting the revolutions of the wheels, which he can do by the sound of the pump valve or other part of the machinery, he can tell from the rule given in the answer to Question 438 the speed at which the locomotive is running. From this rule a table can easily be constructed for an engine with any size of driving-wheels, showing the speed for any given number of revolutions per minute. It will be a good exercise for a young locomotive runner to construct such a table, which will be found very convenient for reference if placed in a conspicuous place in the cab.

QUESTION 478. *What must be attended to in very cold weather?*

Answer. Great care must be exercised to prevent the water in the pumps, pipes and in the tender from freezing. If it does it will be almost certain to break the pump or burst the pipes. To avoid this the heater cocks must be opened so as to keep the water in the tender warm. In excessively cold weather the engine should be run with greater caution than at other times, as iron is then more brittle, and also more liable to break, owing to the frozen condition and consequent solidity of the track.

QUESTION 479. *In running a locomotive in severe snow or rain storms, what should be observed?*

Answer. Whenever it snows the pilot or cow catcher should be covered with boards or, better still, with sheet iron, so as to act like a snow plow. Brooms made of steel wire should be placed in front of the front wheels of the engine, so as to sweep the snow from the rails. The front damper on the ash-pan should be kept closed so as to exclude the snow from the ash pan, which would soon fill it up, and in this way obstruct the draft. If the fall of snow is very heavy or it blows into drifts, the train must of necessity run very slowly, and even if a part of the track is clear of snow, it is unsafe to run fast on it, as there would be danger of throwing the engine off the rails if it should run into the heavy drift at a high speed.

In severe rain storms bridges, culverts and such portions of the track as are liable to be washed away should be approached cautiously, especially at night. In both snow and rain storms, and also in fogs, great caution is required, owing to the difficulty of seeing signals.

QUESTION 480. *What is meant by a reserve engine or "helper?"*

Answer. A *reserve engine* is a locomotive which is not employed in hauling a regular train, but is kept as a "reserve" to go to the help of an engine which may be compelled to stop on account of an accident of any kind, or to assist engines in moving trains up heavy grades, or is used in clearing away a wrecked train, rebuilding bridges or other structures.

QUESTION 481. *What must be observed in running a reserve engine?*

* The methods of giving signals vary so much on different roads that no general direction that will suit all cases can be given.

Answer. As no special arrangements are usually made in preparing time-tables* for the running of reserve or, as they are usually called by railroad men, "*wild*" engines, it may very probably happen that it will be called upon to assist other engines when the road is not clear, and therefore its runner must constantly be on the look out for signals to stop, which are often given suddenly. He must switch off with special caution in order to be sure to keep out of the way of regular trains running in the opposite direction on the same track. When he reaches the train or place where the assistance of the reserve engine is needed, he must approach it *slowly* and *carefully*, in order to avoid a violent shock. On the return from the assisted train, he incurs the same danger, and must pay close attention to any signal to stop made to him by any opposite train on the same track, and also on his part warn such trains by the proper signals.

When a train is run with two engines, both in front of it, the forward one always takes the management of the train. The runner of the hind engine must be guided by the signals of the runner of the forward engine. In starting, the forward engine must be set in motion first and then the one behind it. In stopping the steam must be shut off first in the hind engine. Likewise in decreasing the speed during the trip, the hind engine must first regulate the flow of steam. If these precautions are not observed the forward engine may easily be thrown from the track by the faster motion of the hind one.

When a train is assisted by a "helper" placed *behind* the train, and therefore pushing it, the forward engine must likewise be set in motion first, and steam should be let on in the hind engine only after a signal has been given by the runner of the head engine. During the run both engines must move with the same speed.†

QUESTION 482. *How should switching engines be managed?*

Answer. In pushing and switching the freight cars in the station yard, they should be moved carefully and severe shocks must be avoided, as the cars, the goods with which they are loaded and the persons employed about them may be injured by violent concussions. The runner must also follow the instructions of his superior *strictly* and *cheerfully*, and should examine patiently and observe with discretion the suggestions of employes who are not his superiors.

In this service it is also of special importance that the runner give a *distinct* signal with the whistle or bell before every movement of his engine, in order to warn in time those who at such times often stand on the track in the way of the engine or cars, or the persons engaged in loading, cleaning or repairing the cars, and thus give them time to get out of the way.‡

QUESTION 483. *In firing a locomotive, what are the most important ends to be attained?*

Answer. That which is of first and chiefest importance is to make steam enough, so that the locomotive can pull its train and "*make time*"‖; second it must make the requisite quantity of steam with the least consumption of coal, and third with the least production of smoke, although the latter, independent of the economy of combustion, is considered of importance only with passenger trains. What is frequently lost sight of in considering this subject is the fact that with all locomotives it often happens that it is a matter of extreme difficulty to make enough steam to do the work required of the engines. When a freight train is struggling up a grade with a heavy train, or an express engine is obliged to make time under similar conditions, it often depends entirely upon the quantity of steam which can be generated in the boiler in a given time whether the engine will fail or not. In firing, therefore, the most important end to be aimed at is often simply to produce the largest amount of steam possible in a given time, even at the sacrifice of economy or by producing any quantity of smoke. Any means of economizing fuel or of smoke prevention which reduces the steam-producing capacity of boilers is therefore quite sure to be abandoned in time.

QUESTION 484. *How can a boiler be made to produce the largest quantity of steam in a given time?*

Answer. By burning the greatest quantity of fuel possible on the grate in that time. This can be done by keeping the grates free from clinker and the ash-pan from ashes, and then distributing the coal evenly over the grates in a layer six to twelve inches thick. The thickness of the layer which will give the best results will, however, vary with the quality of the fuel, and must be determined by experience. If the layer is too thick, not enough air will pass through it to burn the coal. If it is too thin, then so much air will pass through that the temperature in the fire will be reduced. The rapidity of combustion will also be promoted by breaking up the coal into lumps the size of a man's fist or smaller. If fine coal is used it should be wet, otherwise it will be carried into the flues by the blast before it is burned or caked or even reaches the grate. Experience will indicate the amount of air which can advantageously be admitted above the fire in order to secure the maximum production of steam. The best size of the exhaust nozzles and the position of the petticoat pipe must also be determined by experience. It will usually be found, however, that if enough air is admitted above the fire to prevent smoke, it will reduce the maximum amount of steam which can be generated in a given time. The fire should also be fed regularly and with comparatively small quantities of fuel at a time, although if the feeding is *too* frequent there is more loss from the cooling effect which results from the frequent opening of the furnace door than is gained from the regularity of the firing. In this, too, a fireman must consult experience to guide him.

QUESTION 485. *How can a locomotive be fired with the least consumption of coal?*

Answer. Two systems of firing are practiced in this country, one known as the "banking system" and the other the "spreading system." When the banking system is employed, the coal is piled up at the back part of the fire-box, as shown in fig. 218, and slopes down towards the front of the grate, where the layer of coal is comparatively thin and in an active state of incandescence. The heap of coal behind is gradually coked by the heat in the fire-box and the gases are thus expelled. Openings in the furnace door admit air which mingles with the escaping gases, which then pass over the bright fire in front, and are thus supposed to be consumed. When the "bank" of coal behind becomes thoroughly coked, it is pushed forward on the bright fire and fresh coal is again put on behind to be coked. This system of firing is practiced on some roads with good results, but it is doubtful whether it could be used successfully with coal which cakes and clinkers badly.

The spreading system is most commonly employed in the Western States, where the coal contains a great deal of clinker. When this is practiced, the coal is spread evenly over the whole of the grate in a thin layer, and its success and economy depends upon the regularity and evenness with which this layer of coal is maintained and the fire fed. The thickness of the coal must be adapted to the working of the engine. When it is working lightly the layer of coal should be thin, but when the engine is pulling hard the layer of coal must be thicker, otherwise the violent blast may lift the coal off of the grates. The success of this system, as was explained in answer to Question 378, depends upon the manner in which the thickness of the fire is regulated, on the admission of the proper amount of air above the fire, and on the frequency with which the fire is supplied with coal. When this system of firing is employed not more than two shovels full of coal should be put into the fire-box at once, and if the engine is not working hard one or even less will be sufficient. The firemen must, however, determine by experience the thickness of fire, amount of air which should be admitted and the frequency of firing which will give the best results in practice. Doubtless these will vary with different kinds of fuel and the construction of engines. Usually the greatest obstacle in the way of producing good results is the fact that firemen would rather "take things easy" than exercise that diligence and observation which will alone insure success in any occupation.

QUESTION 486. *How can smoke be most effectually prevented?*

Answer. The means of preventing smoke were very fully explained in answer to Question 378. It may be said briefly that this can be done only by properly regulating the supply of air which is admitted to the fire. The means of doing this have already been explained.

QUESTION 487. *What method of firing is employed when anthracite coal is used?*

Answer. The spreading system alone is then used.

QUESTION 488. *How may the rules which firemen should observe when bituminous coal is used be briefly stated?*

Answer. 1. Keep the grate, ash-pan and tubes clean. 2. Break the coal into small lumps. 3. Fire often and in small quantities. 4. Keep the furnace door open as little as possible. 5. Consult the steam gauge frequently, and maintain a uniform steam pressure, and if necessary to reduce the pressure do it by closing the ash-pan dampers rather than by opening the furnace door.

QUESTION 489. *On arriving at a station where a train stops longer than a few minutes, what should the locomotive runner and fireman attend to?*

Answer. The runner should examine thoroughly all the parts of his engine, as has been heretofore explained. He should especially examine all the journals and wearing surfaces to see whether they are hot. This he can discover by feeling them. If any of them have become very much heated, they must be cooled by throwing cold water on them, and then thoroughly oiled. In oiling a hot journal mineral oil should never be used, as it is easily evaporated by the heat and then takes fire. Animal oil should therefore always be used on a hot bearing. The working parts should be thoroughly lubricated, as already explained.

The fireman should examine the tank and see whether it is necessary to take in a fresh supply of water. He should then examine the grates and ash-pan, and clean the cinders and clinkers from the former, and the ashes from the latter. Neglecting to clean the ash-pan may result in melting and destroying the grate-bars, and by obstructing the admission of air to the grates the ashes prevent the combustion from being as complete as it would be otherwise. With some kinds of fuel it is necessary to clean the tubes frequently, which must often be done at stations where the train stops.

During the stop, as thorough an inspection of the engine should be made by the runner and fireman as the time will permit; but any unnecessary waste of time must be avoided, and the firing should be so managed that nothing need be done about it during the halt at the station. On starting again the same precautions should be exercised as on making the first start.

QUESTION 490. *After reaching the end of its run, how should an engine be cleaned and repaired?*

Answer. Before reaching the last station the firing should be so managed that there will be as little fire as possible remaining in the fire-box at the end of the run. After the arrival the engine should be run over a pit which is usually provided for the purpose, and the fire should be raked out of the fire box by dropping the drop door, if there is one to the grate, or turning the grate-bars edgwise, or withdrawing one or more of them if it is necessary to do so. In this way the fire will fall into the ash-pan, from which it can easily be raked. After all the fire is withdrawn the dampers and furnace door should be closed so as not to allow the cold air to cool the fire-box and tubes too rapidly.

In order to keep the boiler clean, that is as free as possible from sand, sediment or incrustation, it is necessary to blow it out frequently if the water which is used contains much solid or incrustating matter. With "bad water" the boiler should be blown out as often as possible. On some roads this is done after each trip. In blowing a boiler out, the blow-off cocks must be left open, and after all the water has escaped the engine should be left to stand until it is cooled off. If there is any considerable accumulation of mud or sediment the hand-holes at the bottom of the fire-box and the cover to the mud-drum should be taken off, and as much of the mud removed as can be scraped out through those apertures. A hose pipe attached to the hose of a force pump should then be inserted through these same openings, and a strong stream of water forced into the boiler. By this means much of the loose mud and scale will be washed out. The oftener this is repeated of course the cleaner can a boiler be kept. If a large amount of incrustation or mud has accumulated about the tubes, some or all of them must be taken out, so as to be able to remove the dirt.

After an engine is blown out, under no circumstances excepting absolute necessity should it be filled with cold water until it is entirely cooled off. It should be remembered that any sudden change of temperature in a boiler subjects it to very great strains, and incurs the danger of cracking the fire-box plates, or causing the tubes to leak.

The tender should also be cleaned of the mud which settles in it from time to time, but it is not necessary to do this as often as it is to clean the boiler. All the plates and flues should have the soot which sticks to them thoroughly cleaned off.

Although the cleaning of the boiler and the grates is usually committed to a special set of men, yet the locomotive runner should examine them personally to see that it is properly done. He should pay attention to the condition of the grate, and see whether it is level and smooth. As soon as one or more of the bars are bent crooked, they easily burn out. If one of the bars is burnt out the fire falls through the hole that it leaves into the ash-pan, and then the fire under the grate will heat it red hot, and finally may melt every bar. Every grate-bar which is only a little damaged or bent must therefore be removed as quickly as possible and replaced with a new one.

As soon as the engine is run into the engine-house, all superfluous grease which has escaped from the wearing surfaces and the dust or mud which adheres to the engine should be wiped off with cotton waste or rags. This is usually done by men employed for the purpose. While they are doing this, they should examine every part thoroughly and observe whether it is in good condition, and if any defects are found they should be reported to the proper person whose business it is to have them repaired. As the faithfulness and skill of a fireman are often estimated by the good or bad condition of his engine, he should, if for no other reason, take pains to keep it clean and everything in as good condition as possible.

If the engine is taken to pieces in order to be thoroughly repaired, the runner, if he does not help to do this, should watch carefully the taking it apart and the putting it together again, as in this way he can become thoroughly familiar with the construction of the machine he runs.

QUESTION 491. *What precaution must be taken to prevent the water in a locomotive from freezing if it is laid up?*

Answer. In very cold weather, if engines are laid up for any considerable time, no water must be left in the tender, boiler or any of the pipes. If, however, the engine must be soon used, and it is impracticable to let the water out of the boiler and tender, then, if exposed to the cold, a light fire must be kept in the boiler sufficient to make steam enough to warm the water in the tender. The water should, however, be drawn out of the pumps and the feed and supply pipes. This can be done by opening the pet cocks, and closing the tender valves and uncoupling the hose, which will allow the water in the supply pipes to run out. By running the engine a few revolutions the pumps will then be emptied. The pipes and the pumps can also be prevented from freezing without uncoupling the hose if the tender valves are closed and the pet cocks opened, and steam is then admitted into the supply pipes by the heater cocks. This forces part of the water which is in the pumps out of the pet cocks and warms the rest. This, however, requires constant watchfulness to prevent freezing, and in excessively cold weather, if the engine must lay up for any considerable time, it is always best to empty the pumps and pipes.

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* A *time-table* is a table which gives the time when each train shall arrive at the stations it passes, the stations at which it shall stop, and all the regulations by which it shall be run.

† Katechismus der Einrichtung und Betriebes der Locomtive, by Georg Kosak.

‡ Georg Kosak.

‖ The term *make time* means to run at the speed indicated on the time table.

Railroad Manufactures.

Clark, Reeves & Co., have a contract to build an iron bridge for the Maine Central road at Ticonic Falls.

The water power at Sewall's Falls, N. H., has been sold to a company which proposes to establish a car factory there.

The Schuylkill Iron Company of Pottsville, Pa., proposes to build extensive works at Washington, N. J., the junction of the main line of the Delaware, Lackawanna & Western with the Morris & Essex Division.

Prices of Rails in August.

Bigelow & Johnston report August prices as $48 to $50 gold for foreign iron and $83 to $85 for foreign steel; $56 to $60 currency for American iron and $90 to $95 for American steel. There were no imports of iron at New York during the month, against 41,449 tons in 1873. The steel imports were, for the month, 7,621 tons; for the eight months they were 58,407 tons, against 65,084 in 1873. For old rails the quotations are $34 to $34.50. The firm say in their circular:

"*New Rails.*—In foreign there have been some sales in bond at prices below what they can be imported for, but the stock on hand is still very heavy, and although a large portion of it is tied up by litigation, yet it must ultimately come on the market, and must therefore wield considerable influence on the future of prices. The English market shows a great subsidence in prices, which is likely to be accelerated as soon as the fall shipping season terminates. In American we have not heard of any new business of importance, and inquiries are not so numerous as formerly. If our railroads are to be large buyers this fall, as at one time predicted, it is about time that some signs of it should manifest themselves, and it is to be confessed that the present quietude is very ominous.

"*Old Rails* barely hold their own. The demand is very light, and a large quantity of hypothecated stock still menaces the market."

RAILROAD GAZETTE

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S. WRIGHT DUNNING AND M. N. FORNEY.

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Editorial Announcements.

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

SOME PECULIAR WEAKNESSES OF RAILROAD COMPANIES.

Not railroad men only, but the whole country has watched the condition of railroad business since the panic with unusual solicitude. There are many reasons for this, some of which are obvious. In the first place, railroad construction had, or was supposed to have had a controlling effect in causing the panic. The chief overproduction of which the country had been guilty was an overproduction of railroads. This is doubtless the chief cause why the chief failures have been failures of railroad companies. They had been multiplied until there was not traffic enough to "go around," and, aside from those which the panic caught uncompleted, many have since died of innutrition. While all or nearly all other industries have suffered, some of them greatly, and the iron business enormously, the number of failures have been comparatively small. Merchants and manufacturers suffer but do not die, while there is a veritable epidemic among carriers.

Is there anything in the nature of things or in the organization of railroad companies which makes the latter especially delicate beyond other kinds of business? If railroad business is necessarily an unusually precarious one, then it should be conducted so as to provide unusual safeguards and provisions for emergencies. If necessarily whenever there is great depression in the business of the country, some railroads which are profitable on the average are pretty sure to fail to earn their interest charges, then it is the duty of every company, for the protection of both stock and bondholders, to maintain a reserve to provide for such contingencies, and rates should be charged and dividends made in prosperous years with a view to the wants of less fortunate seasons. Or, indeed, the funded debt should be limited to the amount which the traffic of the worst year can pay interest on, and the stock should be recognized as an investment of uncertain or variable income, or should itself be provided with a reserve by which the results of good and bad years may be equalized to some extent.

We hardly think that, on the whole, railroad traffic is subject to greater fluctuations than most other kinds of business. When business is very dull there are at once fewer transactions to make a profit on and less profit on each transaction; but that is true of most other kinds of business, as the history of the past year has plainly shown o many a novice in business. Perhaps railroad companies suffer more and especially longer by a sudden increase in the number of carriers than most other kinds of business. It might not seem easy to "rush" into railroad business, but in this country during the five years ending with 1872 it was very easy, and the rush was tremendous. It is certainly easier to enter most other kinds of business, but we do not often see so sudden and great a flow of capital into them. The reason of this seems to be that railroad business is in its nature slower to build up than most manufacturing or mercantile operations. Most of them in the course of one or two years give unmistakeable evidence of their success or failure, and if they do not succeed other intending investors are warned off. It is often hard to say whether a railroad is successful or not during the four or five years succeeding its opening, and capital may all this time be invested freely in similar undertakings before the success or failure of the first is assured.

But the chief distinguishing feature of railroad investments is their permanency. In scarcely any other form, except buildings, is so large a proportion of the money invested in a business placed where it cannot be withdrawn in case of disaster. An over investment in most branches of trade and manufacture is likely to result in great loss, it is true, but rarely in a total loss; and in a year or two from the failure of the enterprise a part, and often the largest part, of the capital found unprofitable there will be invested elsewhere. Practically, the money put into a railroad is buried there, so that it cannot be dug up should it prove unproductive. The new railroad has very little rolling stock, and very little money is needed to conduct its business, aside from the daily receipts. The removable parts of the road are worth so much less than when they were put down that we do not remember more than three or four cases where they have been removed. If the railroad is a failure, to the capital it is almost a total failure.

But, doubtless, the reason why so many companies become actually bankrupt, while still earning some net income, is the excessive proportion, in this country, of the funded debts of most new railroads to the total capital invested. It is intended, and properly enough, that the stockholders shall assume the risks, that they shall go without income on their investment, if necessary, for the first few years of the enterprise, expecting a proportionally large income thereafter, if the railroad succeeds. But, it must be observed, if the calculation is that the whole of the net earnings are intended to be absorbed in payments of interest on the funded debt, the calculations have left no margin whatever, and a mere miscalculation in a matter always uncertain or a temporary cessation of national prosperity, or even some accident to a leading local industry, will be sure to bring the corporation to bankruptcy, interrupt at least regular interest payments to the bondholders, and destroy the investments of the stockholders.

If we could publish the total net earnings and the annual interest on all the newer railroad companies of the country it would be seen that in an immense majority of cases of roads which have not failed the margin between the two is excessively small, which means, of course, that the funded debt is but slightly protected. Even the average funded debt of the railroads of the United States is 48½ per cent. of their total capital, and the total net earnings are but 10 per cent. of the debt. The average interest on the latter is probably something like 7½ per cent., and if this is true a decrease of more than a quarter in the net earnings of the railroads of the United States would, if they were a consolidated property, bankrupt them all. Now such a reduction is by no means impossible in the cases of a great many roads. Indeed some roads have had to show a falling off of 25 per cent. in *gross* earnings, and in such a case the reduction in net earnings might well be 40 or 50 per cent. For in the first place such a reduction in gross earnings may, and frequently does, proceed from a decrease in average charges with little or no decrease in the bulk of traffic, and, second, it is never possible to reduce legitimate working expenses in proportion to a decrease of traffic, unless there has been an enormous fall in the cost of labor and materials.

Still another reason why railroad companies succumb to misfortunes which affect other enterprises only temporarily, is the fact, before noticed, of the immovability of their property. They cannot take from their capital to provide an income in any legitimate way, and in no way to a large extent. In most kinds of business, if the income fails to be sufficient to meet pressing debts, the business can be made smaller and the money received from this realization of capital be expended to save the house from ruin. Scarcely ever can a railroad company do anything of this kind. Its earnings are its only source of income; if its condition is known, and if it cannot pay its debts out of these, it must fail. There is, however, an illegitimate way in which capital can be made to provide income, and has been providing it, doubtless, on hundreds of railroads in the United States during the past year. This is by the process commonly known as "starving the road," that is, omitting for a time repairs and renewals, and so saving the money which is required to maintain the condition and the value of the property. A great deal can be effected by this process for about a year, and in hundreds of cases bankruptcy has been staved off in this way. It is needless to say, however, that it is a very costly process, as a hundred thousand dollars may very likely be needed next year to complete the repairs which would have cost fifty thousand this, while working expenses are meanwhile largely increased by the imperfect condition of road and rolling stock. It is a measure, however, to which companies are sure to resort when they cannot otherwise meet their mortgage debts. If they succeed thereafter in getting income enough from traffic to renew the property, they save the property to the stockholders, who are the company; if they fail, the loss in the form of the depreciation in value of the property falls wholly upon the bondholders, when they sell or take possession of it under the mortgage.

We have endeavored above to point out some of the peculiar features of railroad property which, if not guarded against, make it especially precarious; features which, it seems to us, explain why these corporations have been, as managed in this country of late, especially subject to insolvency. Of course companies whose debt calls for but a small proportion of their average net income are not liable to insolvency, notwithstanding great fluctuations in business. This is a condition which ought to be indispensable to good credit, and besides it is worthy of consideration whether some provision for equalizing dividends, or at least providing something like an insurance of a dividend, would not be practicable and advantageous in the case of those companies which usually pay considerable dividends, thus making the stock a safer dependence as a source of regular income.

RAILROAD SERVICE REFORM.

There are probably very few people who are not to a greater or less degree controlled or influenced by some theory of life which they have constructed or evolved, to use a Herbert Spencerian phrase, out of their environment. Such theories often become the objects of very great intellectual pride, so that all the phenomena of life are adjusted or distorted in support of them. They thus become a sort of haven of refuge or an intellectual re-agent by which we resolve the riddles of life. Every occurrence which strengthens the theory, especially when we are afflicted with doubts regarding its universal applicability, is a consolation and an encouragement.

Now we confess to having some such theories, some that we have stood in defence of for a long time, and against which the current of events has poured like a torrent for these many years, and—this in a whisper—our confidence in one of them has sometimes "weakened," to use a Westernism. Now, the particular theory referred to is this: we have believed, and so preached, that the time was coming when brains would be recognized as a necessity in the successful operation of railroads. Taking into account all the precedents and some of the impressive lessons which modern history has taught, with the valuation which we Americans have traditionally ascribed to knowledge and intelligence, we have been compelled to conclude that the value of brains has not thus far been sufficiently recognized in the management and operation of railroads. Although this inference has been sustained by all the evidence, and the most exact logical deductions therefrom, nevertheless brute force and ignorance have reigned supreme so long and so generally in politics and railroads that, as we say, we began to "weaken" a little in our faith of the soundness and truth of our deductions. It was therefore with somewhat the same feeling that a half-famished man would receive a hearty meal that we read the following general order, which has just been issued by Mr. Charles Paine, General Superintendent of the Lake Shore & Michigan Southern Railway:

"Notice is hereby given to employes connected with the running of trains, that they must make themselves perfectly familiar with the general rules printed upon the time tables, and with the special rules upon the time table of the division where they are employed. Hereafter no promotion to the position of conductor or of engineer will be made until after the candidate shall have been examined as to his knowledge and understanding of these rules by an Examining Board, whose certificate of qualification he must receive. The Board of Examination for conductors will consist of the Superintendent of the division upon which the candidate is to be employed, assisted by at least one, and, if practicable, two, other Superintendents of divisions. When a candidate for the position of engineer is to be examined, the Board will consist of the Superintendent of Division, the Master Mechanic of the division, and, when possible, of another Superintendent or Master Mechanic, who shall be requested by the Division Superintendent to sit with them. The candidate's certificate must receive the signature of all the members of the Board, else his appointment will not be confirmed. The certificate must be approved, in the case of an engineer, by the General Master Mechanic, and in that of a conductor by the General Superintendent. Proper forms for such certificates will be prepared and supplied to the superintendents of divisions. Those conductors and engineers who are now in the service will be required to pass an examination before a board similar to that designated for candidates, as the convenience of the superintendent of the division will permit; and such as may prove deficient in a knowledge and comprehension of the general and special rules will be suspended from the service until they shall be found qualified to receive a certificate."

This order will, we suspect, be rather rough on some of the "practical" men who pride themselves so much on the fact that they don't know what some other people do. It will also be equally hard on some of the fresh young men just out of school, if they should fall into the hands

of some knowing old chap who has handled a throttle-valve for a long time or conducted trains through the obscurities and obstructions of snow-storms, and obeyed the rules of his time tables or his running orders when it was next to impossible to run.

If such an order as that printed above should, as we believe it will, have the effect of making railroad employes feel that their advancement will depend upon what they know, and not upon their getting in favor with some Tom or Hank who rests content in the belief that "no person can't learn him nothing," then it will repay all the trouble and expense which its enforcement may require. One of the great evils at present existing among railroad employes is the confirmed belief so generally held that they can expect no reward for either good conduct or for superior knowledge. It begets a sort of dead level of stolid indifference and hopelessness. It is also unfortunately true that in many places it is better for an employe to hide his knowledge, if he has any, than to let it be known, and if a man devotes any time to the acquisition of information, it is better to keep the fact secret if possible, because otherwise it will be quite sure to excite the envy of some one who has more authority but less knowledge. The effect of such a general order as the above at once gives the highest official approval and recognition to merit. More than this, it gives a court of appeal before which a candidate for advancement will be heard. It thus gives to the superior officers the means of looking as it were over the heads of those below them, and identifying those in the ranks below who are really meritorious. At present a young man's advancement depends very much upon the report of him which is given by the person immediately over him. Thus a brakeman who aspires to be a conductor is very often dependent upon the report made of him by the conductor of the train on which he is employed. This report is nearly always one which is made in secret, and often as vague as the shake of a man's head, so that the candidate has no means of refuting what is said in his disfavor. The same thing is true of favorable reports of a similar kind: they may be deserved or they may not, but doubtless there have been conductors who valued the silence of a brakeman on some subjects more than the most faithful service to the company. Firemen are of course liable to have similar injustice done to them. At any rate, the system of examination will bring the officers in immediate contact with the men. They will be able to judge of their capacity by personal examination and questions, and will not be compelled to take all their information at second or third hand.

It cannot be denied, however, that it will be extremely difficult if not impossible to devise a system of examination which will be a sufficient test of the capacity of men for certain duties. With conductors it will doubtless be easier than with locomotive runners. Conductors must be familiar with the rules of the road which govern the running of trains, the system of tickets which they must collect and methods of acting in case of accident or emergency; but there are certain physical, mental and moral characteristics which a locomotive runner must possess which hardly any examination would reveal. Personal energy is a characteristic which has hardly any relation to facility of answering questions. A man may have all the knowledge required for the one, and yet have very little of the former trait. Quickness of sight, physical strength, endurance and courage must be revealed by some other method of examination, and will hardly be tested by any catechitical system. Many a locomotive runner, we feel sure, who would stick to his engine with death as plainly before him as the signal which he sees, would be abashed and confused by the simplest questions, should he be summoned before an examining board of his superior officers. This suggests the propriety of divesting such examinations of some of their awful solemnity, which is so oppressive and confusing to young candidates. There is something about such assemblages which always recalls to our minds the impressions produced by the pictures of the Spanish inquisition in the old Sunday-school books. If a raw youth is to be examined to learn what he knows, by all means let the surrounding circumstances be such that he will not have what little he does know scared out of him. For this reason it seems that it would be better to hold such examinations in an engine house, or at least beside a locomotive, so that the objects about him may enable the person to express what he knows. Power of mere verbal expression and description is perhaps the least of the qualifications which an engineman need to possess. Any one who has ever attempted to describe any mechanical device knows how very difficult it is to make such description clear without drawings or some other method of illustration. Now to ask a boy whose education is extremely limited to explain what he knows about machinery by words alone is to put him to very great disadvantage for no useful purpose, and at the same time is placing the man with assurance and "gab" at an advantage and showing the modest one at his worst.

An examining board will therefore be obliged to exercise considerable skill in devising a system or examination which will effectually distinguish the best candidates from those who are less deserving. On many roads systems of examination have been employed for years, but we are inclined to doubt whether thus far the full benefits which may accrue from that method have been realized, which we hope will be the result of the above order.

Locomotives for the New York Elevated Railroad.

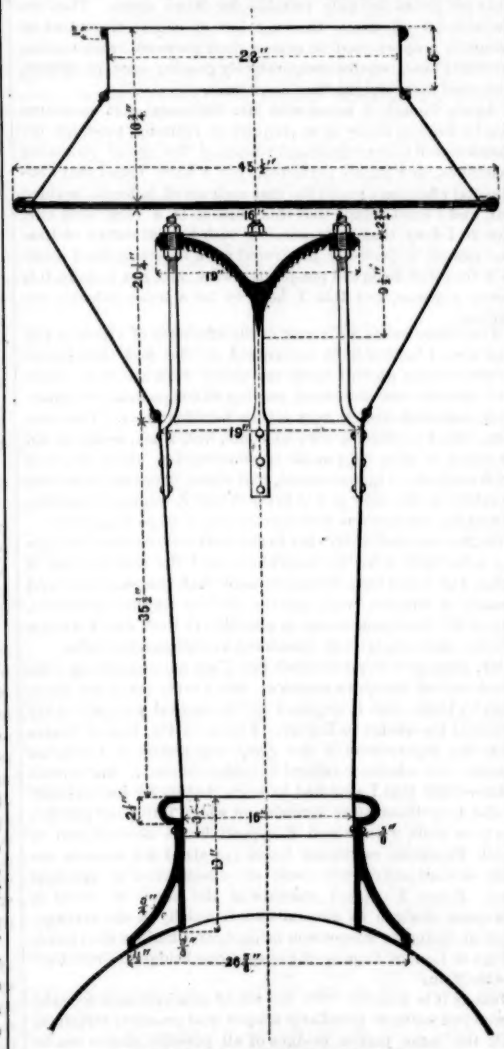
We learn that we were in error in attributing the engines for the New York Elevated Railroad to Mr. Juan G. Ribon, of Jersey City. They were designed by Mr. D. W. Wyman, Superintendent of that road, under whose superintendence they were built. The company is now building all its engines in its own shops at the foot of Broadway.

Record of New Railroad Construction.

This number of the RAILROAD GAZETTE has information of the laying of track on new railroads as follows:

Portland & Ogdensburg.—Extended northward 3 miles to Bemis, N. H. *Rochester, Nunda & Pennsylvania.*—On this line 10 miles of track has been laid north and south through the town of Nunda, N. Y. *Galveston, Harrisburg & San Antonio.*—Extended from Harwood west 9 miles to Luding, Texas.

This is a total of 22 miles of new railroad, making 984 miles completed in the United States in 1874, against 2,408 miles reported for the same period in 1873 and 4,264 miles in 1874.



IMPROVED SMOKE STACK.

By J. M. BOON, *Master Mechanic Pittsburgh, Fort Wayne & Chicago Railway.*

THE CROP MOVEMENT, as shown by the receipts at the lake ports (Chicago, Milwaukee, Duluth, Detroit, Toledo and Cleveland) and St. Louis, for the two years past during the month of August, is hardly to be called light, though a seventh less than last year, and the decrease is wholly in corn. Nearly ten per cent. more wheat was marketed. The total receipts are a little larger than in 1872, but 20 per cent. less than in 1871. The decrease in corn receipts is 43 per cent., amounting to 4,266,000 bushels, and the receipts of that grain are the smallest for four years.

NEW YORK CITY RAILROADS are to form the subject of an examination and report by a committee of the American Society of Civil Engineers specially appointed for this purpose. They are to consider not only the question of passenger roads, which is the need the general public most feels, but that of freight roads or other means for distributing freight in the city, and also storage; and the freight question doubtless more nearly concerns the commercial supremacy of New York than almost any other.

FAST TIME is reported on the Chicago & Northwestern Railway between Clinton and Chicago, a special train having made the distance of 138 miles in 153 minutes, including several stops. According to one statement these stops consumed 11 minutes, according to another 15; if the latter is correct the speed was exactly a mile a minute, which seems almost impossible for so long a run.

Improved Smoke-Stack.

The smoke-stack represented in the engraving herewith is one designed by Mr. J. M. Boon, Master Mechanic of the Pittsburgh, Fort Wayne & Chicago Railway. Its chief peculiarity consists in the form of the lower part of the stack between the base casting and the receptacle for sparks. This portion of similar stacks is usually made cylindrical, but in the one illustrated it is made tapering, as shown in the engraving, and, as indicated by the dimension marks, is 16 in. in diameter below and 19 in. above. We have several times called attention to the fact that in Europe a large proportion of the smoke-stacks for locomotives are made tapered in this way, and that probably considerable advantage would be derived from a similar practice applied to the form of smoke-stacks used here. Mr. Boon has, we believe, been the first one to apply this form of construction. He reports much better results from its working than from the old forms. The best proportions are, however, not yet determined, and whether the inside or petticoat pipe should be tapered or straight it has not yet been made clear. Our own impression is that the base of the stack might be more contracted to advantage, and that the petticoat pipe should be tapered the reverse way to that of the stack, so as to have its widest part below. Who will try this experiment and report its results?

Contributions.

The Narrow Gauge.

PHILADELPHIA, September 4, 1874.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your remarks appended to the communication entitled "Progress of Narrow-Gauge Railroads," which appeared in your issue of August 29, call for a response, and the writer is glad to have the opportunity of again addressing you.

In the RAILROAD GAZETTE of February 22, 1873, I find in the editorial columns, "that the enthusiasm for narrow-gauge railroads is diminishing in this country, there can be no doubt, and we can confirm what Mr. Evans reports in his pamphlet—that there is now but little inquiry and fewer orders for narrow-gauge engines." A list is given showing 484 miles of narrow gauge, and it is hoped that the narrow-gauge enthusiasm will expend itself like the horse epidemic.

And in your issue of June 20, 1874, you apparently regret "that the narrow-gauge fallacy has again revived, and the discussion broken out with renewed virulence."

That you most thoroughly discountenance the narrow-gauge movement is palpable, and why "there is no prospect whatever that two-thirds of the projected lines will ever be completed," remains to be seen. The probability is, however, that the roads will be carried to completion, notwithstanding "that there is but little inquiry and fewer orders for narrow-gauge engines," although large locomotive works in this city affirm that 26 per cent. of the engines built by them up to July of this year are narrow-gauge. This increase of 16 per cent. over last year is not, however, indicative of the general narrow-gauge business.

In the list of narrow-gauge track laid some corrections were found necessary by you, and a statement showing 214 miles as not built was prepared; seeing, however, that my information was obtained directly, or very nearly so, from parties interested in the various roads, I must point out that you are in error. By reference to Vernon's Manual it will be seen that the Cheraw & Salisbury *has* 23 miles of track laid. The President of the Chester & Lenoir Railway advised the writer that the gauge of the King's Mountain road, with which they consolidated on April 3, had been changed to 3 feet; also that the road was to commence running regular trains on August 31. Cars were supplied them by works at Wilmington. The whole length of line is under contract. It is worthy of notice here that a broad-gauge road has been converted into one of 3 feet, and that it is not the only one in the United States. In the Railroad Manuals the mileage in operation of the East Broad Top is given as 12 miles, but it must not be supposed that nothing further has been built since the date of that report. The President informed me that 25 miles of their track was laid, and he has since advised your correspondent that the remaining five miles are now being laid at the rate of half a mile a day. Trains are to be running over the entire line of 36 miles by the 15th inst.

The Okolona & Grenada had the iron on hand for their entire road and were laying it. When last heard from five miles of track were down, and they were progressing.

The South Branch had their 16 miles of track laid but a short time ago.

From various sources the information was culled that the remainder of the roads had track laid. It was a mistake, though, to have placed the North and South of Georgia at 35 miles in operation—20 is the correct number.

Your knowledge of the railroad business is so extensive that I need only remind you here that the standard gauge of to-day was at one time as greatly condemned as the narrow at the present time, and the da may not be far distant when those who are antagonistic to it will give it their support and swell the ranks of the "few eminent engineers who believe in the narrow gauge."

In answer to your question, Why cars can be built light for the one gauge and not for the other? I reply that they can; but when I ask, How would they stand the concussion when made up or in collision with the cars now used? the question is evaded. Standard cars built as light as those on narrow-gauge lines will not possess at the same time the same strength. For instance, take a bar or beam of a given strength and place its supports three feet apart, then find its maximum carrying load without fracture or breaking weight, then place the supports 4 ft. 8½ in. apart and find the breaking weight. The difference between the two results will give a balance in favor of the beam having its supports three feet apart. The

latter not being able to carry the same maximum load as the former, a stronger beam must be made use of, and in consequence more weight will be entailed; therefore, to carry th same load as a narrow-gauge car, a "standard" must be heavier.

With reference to curves, if you produce those on the elevated road in New York and which have only 56 feet radius, I can name undergroun] railways where trains run round 48 and 25 feet radius curves, the gauge being 3 feet.

The remarks passed on grades and the ranking of an elevator with a railroad are not worthy of the RAILROAD GAZETTE. The fact is before us that narrow-gauge trains do surmount heavier grades than those of standard roads. HOWARD FLEMING.

[Our correspondent is narrowing down the controversy, the reasoning of which, as we have frequently pointed out, rests upon the assumed fact that cars built for roads whose rails are placed say three feet apart, can be built lighter than if their wheels are 4 ft. 8½ inches apart. The reason for this, he says, is because a long beam supported at the ends must be heavier than a short one. Now let us see which beams of a car will be lengthened or shortened by the distance between the rails: It is very evident that a narrow-gauge car body may be run on wide-gauge trucks, and therefore its weight will be the same for both gauges.

The *difference* in the weight of the cars must therefore be in the trucks alone. It is also evident that to carry the same car body and the same loads the wheels, journal-bearings, springs and longitudinal side-beams must be of the same strength and weight. It is only the cross beams of the truck which are lengthened. These are the bolsters, the axles, the brake-beams and in some trucks the end cross-pieces of the truck frames. We leave our correspondent to estimate what the difference in weight due to the difference in length of these parts will amount to. We do not believe it will increase the weight of the cars when loaded one per cent.

It must also be remembered that car bodies can with safety be made only about twice the width of the gauge, and therefore in order to get the required capacity on a narrow-gauge they must be made long and narrow. The weight of cars for the narrow gauge is therefore increased much more by the necessity of lengthening the longitudinal timbers then it is reduced by shortening the transverse ones.

With reference to the question how light wide-gauge cars would stand the concussion with heavy ones, we have simply to say, that if it is desirable to use light cars, and the only cause to prevent their use is that they cannot be run among heavy cars, then all that is necessary is to keep the heavy cars off of the light trains, which reduces the argument in favor of the narrow-gauge to this, that on the one gauge heavy cars can be run and on the other they cannot.

With reference to the fairness of quoting the Elevated Road as proof of the possibility of operating curves of short radius, all we say is that it is a road over which a large number of trains and of passengers are carried daily and is operated with locomotives. It is an example of what can be done on a light wide-gauge railroad, and as such may be fairly quoted as an illustration of what can be done with such roads. But when Mr. Fleming, in order to prove that steeper grades can be operated on narrow than on wide-gauge roads, quotes a road which, we have shown, it is impossible to work with ordinary locomotives, but on which trains must be drawn up with wire ropes or other expedients than the adhesion of the driving-wheels of the locomotive, then we say it is quite fair and "worthy" that we or any one else should call attention to the inclined planes employed at mines, or to elevators such as we referred to. The reason why such steep grades can be employed have nothing at all to do with the gauge of the roads, which is what we endeavored to show.

We have not yet learned that the law of gravitation acts differently on a narrow-gauge road than it does on a wide gauge, which would certainly be necessary in order to enable locomotives to pull more on the one than on the other.

Mr. Fleming speaks of underground narrow-gauge roads where trains run around curves of 48 and 25 feet radius. Almost any horse railroad has curves of shorter radius around which trains could be run at slow speeds. The point which we want presented clearly is that the shortness of the curves or steepness of grades which can be operated is not dependent upon the gauge, but upon quite other considerations.

As to the increase in the *proportion* of narrow-gauge locomotives built by the Baldwin Works from 10 per cent. in 1873 to 26 per cent. in 1874, that looks very well. But Mr. Fleming omitted to say that the Baldwin Works built three times as many engines last year as this, and 26 per cent. of 100, if our arithmetic is correct, is considerably less than 10 per cent. of 300.—EDITOR OF THE RAILROAD GAZETTE.]

English versus American Bridges.

COLOGNE, August 21, 1874.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the number of August first of your GAZETTE I found a letter of Mr. Ewing Matheson, of London, in which this gentleman reviews my paper on English and American bridges. There are some points in Mr. Matheson's letter which need further explanation, and some others which need correction, as far as myself is concerned. I therefore ask you to be so kind as to open your columns for my reply.

Mr. Matheson thinks I have not arrived at a very high degree of perfection in limiting the play in pinholes only to less than 1-50th of an inch.

The general usage in America is a play between 1-32d and 1-50th of an inch, which, as those know who have erected large structures of this kind, with many links of bottom chords, is a practically advisable accuracy. The hypothesis of hammering of pins in the holes must be confirmed by proof, since no such action seems to have been noticed thus far in the States, before we can admit that pin-jointed bridges, "after a few years of service under railway traffic, will not equal good riveted work." On the contrary, I believe that much rather it must be expected that the head friction of rivets under railway traffic will suffer considerably, and that by this riveted structures will lose much more of their reliability.

Of course all depends on the size of the pin, as compared with the size and number of bars connected by it. This size also depends (as I have stated in my paper) on the accuracy of workmanship. The larger the play the larger the pin must be, and in this regard the only question is, whether we should rather sacrifice material of pins or cost of workmanship.

Mr. Matheson decidedly argues wrong when he concludes that pin-joints are only suitable for large spans. They are suitable for all spans whatever, but of course they must be properly proportioned to answer their purpose. Small spans, in either case, require comparatively greater care in details, and need more weight than large ones.

Again, though I agree with Mr. Matheson that punching *can* be done so nicely as to require no reaming, provided the canstruction is very plain and admits of the use of punching machines, now highly perfected, yet I have found that Continental engineers prescribe that each set of holes be reamed out, and I must admit that this caution is a very wise one. Nor do I deny that it is *possible*, with a great outlay of time and money, to perfectly *fit* riveted work together, but I maintain that well designed pin-jointed work does not require this heavy expense, and this I hold to be a most valuable advantage.

That there exists a distrust of the efficiency of rivets in Europe also, I believe to be recognized in the fact that Continental bridges which I lately saw under work are to be made with *crucible cast-steel rivets*, bearing 86,000 pounds per square inch, and subjected to very severe bending tests. This caution, also, I consider a very wise one, but, I ask, would it not be better to give up a mode of construction which requires such methods of improvement, and would it not be preferable to return to the *older* and at present highly *improved practice* of making connections with turned pins of large diameter?

On the occasion of my visit to the works where these bridges are to be built, I saw the inspectors exact the reaming out of holes, and I also have been informed that the exactness and quality of English work and the skill of English workmen, which Mr. Matheson seems to place above work and workmen of other nations, are not considered as indisputable facts.

Mr. Matheson seems to think that I am not acquainted with the details of European practice. But I reply that I am European by birth, that I acquired my theoretical and part of my practical knowledge in Europe. I came to the United States with the superstition of the great superiority of European practice and science in regard to bridge matters. But I must acknowledge that I soon had to learn that by far the majority of the long theoretical formulæ, on which European practice has been built, with which European books abound, and of which European engineers boast (as also I did myself), are built on sand and do not stand the examination of practical men. Hence I am not unaware of the abuse of rivets in European designs in general and especially in the arrangement of chains for suspension bridges, and besides the Ordish bridge in London I quote the suspension bridge in Frankfort-on-the-Main.

Just as it is possible with the aid of glue and nails to make of wood all sorts of peculiarly shaped and practical furniture, with the same justice bridges of all possible shapes can be designed, and so-called æsthetic considerations can be satisfied by riveting together angles, plates, and plate-patches. The various modes of forming cross-sections of top chords and other compression members in Europe are not unknown to me, but I think there is a greater variety of original forms of such sections in the United States than anywhere else.

My reviewer says that "Mr. Bender is, from his position, probably committed to, and his name is certainly associated with, a certain kind of structure, of which the Phœnixville truss may be taken as a sample." To this remark I answer, that I am not at all committed to one class of details, that I am not in any way connected with the Phœnixville Bridge Works, and that their details, covered as they are by patents, are practically inaccessible to me. Indeed, I have *not the desire*, though I have "the facilities," for making riveted structures, and I cannot admit that I "argue like an advocate or special pleader rather than a judge." This objection could readily be returned by the question, whether Mr. Matheson does not act here as pleaders sometimes do, who throw suspicion on the opponent's *motives*, when they cannot disarm their arguments.

Though Mr. Matheson thinks that I exaggerate the difficulty erecting riveted work, I can speak from experience and recommend distrust in the reliability of riveting in the field, and to increase the calculated number of such rivets by 30 to 50 per cent., according to lesser or greater difficulty of driving.

The nature of men is probably the same among all civilized nations, and I think we cannot trust to English workmen any more than to American. But on the conscientiousness of such men the character of riveted work, excepting that made by the limited use of the rivet machine, must depend.

We do not know of any reliable mode of testing the quality of rivets, and the range of quality from a tightly driven to one which can be shaken in the hole by hand is a very wide one.

From Mr. Matheson we learn that he builds pin-jointed bridges as well as riveted ones, that he advocates riveted work from point of quality and pin-jointed work on the score of economy. A similar use happens with me, only that the reverse is the case, and that for all spans whatever, as far as *quality* is concerned, *and* for the sake of *economy*, *both of which are utterly inseparable*, I prefer well-proportioned pin-jointed structures; but I am prepared to furnish riveted work, if the customers cannot be convinced of the superiority of the originally *older system*, as improved by the best American firms, in contradistinction to the *newer* English practice, consisting of the application of the rivet joint in *all cases*; and I hold that this joint is only useful under certain conditions, though it has been proclaimed in Europe to form the climax of perfection.

Mr. Matheson's remarks might perhaps induce those who are less acquainted with the practice of bridge construction to believe that the system of pin connections is capable of stretching the principles of the theory of elasticity, so as to build structures which, though conforming to the specifications, are in fact less valuable. Such is not the case: the pin-jointed bridges are, on account of their great simplicity, *par excellence* those whose proportions remain the least doubtful.

On the contrary, no construction is more capable of abuse of principles of the theory of elasticity than the riveted one. There all possible deceptive rules can be introduced to diminish the number of rivets and the size of covering plates, and to calculate the strength of the remaining cross-section favorably *toward selling*. Thus the web-plates can be reduced to a theoretical minimum, and all sorts of bad workmanship and of bad material can be hidden, patches made of cross-ends can be utilized, and patchwork in general can be introduced. The defects of such bridges, when finished and painted, for the most part can no longer be detected. * *

At present travelling in Europe, I have not yet found any cause whatever for changing my views. On the contrary, I have noticed small bridges in Belgium which have lost numbers of rivets in the vertical stiffeners of the webs, and I have arrived at the conviction that nothing is more obnoxious to the progress of technical pursuits than handing the examination of plans over to Government engineers, who have gathered their instruction about matters principally practical from the lectures of those who, as a rule, are not the proper persons to judge—namely, at university and polytechnical institutions, without practice, or from the books written by these gentlemen.

Mr. Matheson holds that riveted work should be preferred in Europe on account of its more permanent character.

But so much do I differ in regard to this, that I am about to propose to the German Government the older and now improved details, because bridges built with them I consider not only to be more substantial and trustworthy than the first, but especially because in time of war they can readily be taken down and replaced when the danger has passed.

As regards æsthetic reasons for building low trusses in preference to deep ones, I must say that the taste of the people in general can hardly be an argument for their adoption. In matters of taste about such subjects, a dispute could only be admitted between those who are capable of judgment based on technical arguments. It is simply bad taste to prefer the practically less perfect structure, the unnecessarily clumsy and unmechanical one, to one in which each part has the proper dimensions so as to answer its purpose in the best manner and with the simplest means. From this standpoint, which is, that the most perfect thing is also the most beautiful, I decidedly prefer the new American structures of good proportions; but I cannot detect any beauty in a tubular bridge, in a Windsor, a German "Schwedler" bridge, nor in the famous Charing Cross Bridge.

Nor is the plan of a bridge which offers great surface to the eye one which is adapted to the nature of iron. Such a plan approaches the wooden lattice bridges far more nearly than scientifically understood structures, and I am quite certain that the English people would have a better taste about bridges if their engineers had given them structures better proportioned and with simpler details.

CHARLES BENDER, C. E.

COLOGNE, August 21, 1874.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

—Under the new organization of the Department of Motive Power of the Erie Railway the following appointments have been made:

Vincent Blackburn, Master Mechanic Jersey City shop.
Robert Wallace, Master Mechanic Susquehanna shop.
John Van Vechten, Master Mechanic Port Jervis shop.
J. W. Chapman, Master Mechanic, Hornellsville.
F. N. Wilder, Master Mechanic, Buffalo.
Arthur T. Back, Master Mechanic, Rochester.
D. B. Goodell, General Foreman, Elmira.
Milton Wilder, Foreman Car repairs, Buffalo car-shop.

No appointment has yet been made for the Eastern car-shop at Jersey City.

—Mr. H. H. Roberts, General Freight Agent, has been appointed Superintendent of the Peninsular Division of the the Chicago & Lake Huron Railroad, in place of Malcolm Black, who has resigned. His office is at Battle Creek, Mich.

—Capt. J. F. Whitfield, heretofore Claim Agent and Inspector of Agencies, has been appointed also General Agent of the South & North Alabama road, with office in Montgomery, Ala.

—Mr. M. F. Reynolds has been chosen President of the Rochester & State Line Railroad Company, in place of Mr. Whitney, resigned.

—Mr. J. A. Beauvais is President of the new organization of the New Bedford & Fall River Railroad Company.

— Major J. F. Barnard, General Superintendent of the Kansas City, St. Joseph & Council Bluffs road, has been ap-

pointed General Superintendent of the Atchison & Nebraska Railroad, in place of C. C. Smith, resigned. Mr. George Olds, General Freight and Ticket Agent of the Kansas City, St. Joseph & Council Bluffs, is also appointed to the same position on the Atchison & Nebraska. Both gentlemen will continue to hold their former positions, and will act in their respective capacities for both roads.

— Mr. H. N. Fries, of Salem, N. C., has been chosen a director of the North Carolina Railroad Company, in place of John R. Harrison, of Raleigh, resigned.

— At the annual meeting of the Albany & Susquehanna Railroad Company, September 1, the following directors were chosen: Thomas Dickson, David Groesbeck, J. Pierpont Morgan, Samuel C. Thompson, New York; Joseph H. Ramsey, Robert H. Pruyn, Wm. L. M. Phelps, Albany, N. Y.; Minard Harder, Cobleskill, N. Y; John Westover, Richmondville, N. Y.; John Cook, Worcester, N. Y.; Jared Goodyear, Colliersville, N. Y.; Arnold B. Watson, Unadilla, N. Y.; Ira E. Sherman, Sidney Plains, N. Y. The road is leased to the Delaware & Hudson Canal Company.

—Mr. Charles J. Quetil has been appointed Chief Engineer in charge of preliminary surveys of the projected Peoples' Freight Railroad.

—Mr. Wm. H. Turreff, formerly Assistant Master Mechanic of the Cleveland & Pittsburgh Railroad, has been appointed Master Mechanic of the Lake Shore & Tuscarawas Valley Railroad in place of Mr. Charles Fellows, who has resigned. His office is at Black River, O.

—The Master Car Painters' Association at its annual meeting in Buffalo last week elected the following officers for the ensuing year: President, M. W. Stines, Boston & Albany, Springfield, Mass.; Vice-President, R. G. Beasley, Maine Central, Waterville, Me.; Secretary and Treasurer, R. McKeon, Atlantic & Great Western, Kent, O.

—At the annual meeting of the Carthage, Watertown & Sackett's Harbor Railroad Company, held at Watertown, Sept. 2, the following were elected directors for the current year: George B. Phelps, Theodore Canfield, Norris Winslow, George A. Bagley, Walter B. Camp, Henry W. Shedd, Hiram Converse, Isaac Munson, David Dexter, Pearson Mundy, Rosewell P. Flower, Willard Ives, George H. Sherman.

— Mr. Thomas Howard has been appointed Master Mechanic in charge of the Norwich (N. Y.) shops of the New York & Oswego Midland Road, in place of C. E. Scruton, resigned.

—Mr. Daniel R. Garrison, now Vice-President, has been appointed also Assistant General Manager of the Atlantic & Pacific Railroad and leased lines, with office in St. Louis.

—Mr. John A. Hanglin has been appointed Master Mechanic of the Texas & Pacific Railway in place of W. H. Hipple, resigned.

—Col. A. Johnson has been appointed Land Commissioner of the Atchison, Topeka & Santa Fe Railroad, to succeed Mr. A. E. Touzalin, who has gone to the Burlington & Missouri River.

—The board of directors of the Southern Central Railroad has elected the following officers for the ensuing year: President, E. P. Ross; Vice-President, Thomas C. Platt; Treasurer, C. L. Rich; Secretary, John N. Knapp.

—It is reported that Mr. Edmund S. Bowen, late of the Kansas Pacific, will succeed Mr. Jas. C. Clarke as General Manager of the Erie Railway.

—A telegram from London, Eng., to the Toronto (Ont.) *Globe* says:

"The following gentlemen will be members of the new board of directors of the Great Western Railway of Canada: Right Hon. Hugh Childers, a member of Mr. Gladstone's government, and formerly a resident of Australia; Col. Gray, Messrs. Bald, Beckwith, Maclure, McMaster, Stitt and Seymour Clark. Messrs. Bald, of Glasgow, Maclure, of Manchester, and Stitt were members of the Investigating Committee."

PERSONAL.

—Mr. James Hogan, Master Mechanic of the Boston & Maine Railroad, shot and killed himself at his residence in Boston, Mass., September 3. No cause is assigned for the act.

—Mr. J. W. Clapp, for 17 years past General Ticket Agent of the Maine Central Railroad, has resigned his position.

—Mr. Charles Fellows, who has been Master Mechanic of the Lake Shore & Tuscarawas Valley Railway from its first organization, resigned his position, August 31. As a testimonial of the high esteem in which he was held, his friends in the locomotive and car departments presented to himself and wife an elegant silver service of 15 pieces, including water cooler and goblets. The presentation was made at the shops.

—Mr. John Van Scoy, of Narrowsburg, N. Y., for many years Bridge Inspector of the Delaware Division of the Erie Railway, has been retired by the abolition of his office. He had been in the company's service 25 years.

—John G. Foster, Lieutenant-Colonel of the Corps of Engineers, Brevet Major General U. S. A., and during the war a Major General of Volunteers commanding an army corps, died at Nashua, N. H., Sept. 1. General Foster was once Professor of Engineering at West Point, and at the time of his death had charge of certain government works at Boston.

—Mr. W. H. Hipple, the retiring Master Mechanic of the Texas & Pacific Railway was presented with a valuable watch and chain by the employes of the road. The presentation took place at Marshall, Tex., August 31.

TRAFFIC AND EARNINGS.

—The shipments of through freight eastward over the Central Pacific Railroad during July were: San Francisco, 4,024 tons; interior points, 976 tons; total, 5,000 tons, or 500 carloads. The principal items were: wool, 1,196 tons; tea, 705 tons; salmon, 690 tons; fruit, 372 tons.

—The earnings of the Connecticut & Passumpsic Rivers Railroad for the year ending June 30, 1874, were as follows:

Earnings ($5,323 per mile)	$771,902
Expenses (64.66 per cent.)	499,112
Net earnings ($1,881 per mile)	$272,790

—Cotton receipts at St. Louis for the year ending August 31 were: 1874, 103,741 bales; 1873, 59,709 bales; increase, 44,032 bales, or 73¾ per cent. Of this amount 27,538 bales, or 26⅛ per cent., came by river, the balance by rail. The only roads bringing any considerable amount were: St. Louis & Iron Mountain, 53,980 bales; Missouri, Kansas & Texas, 17,816 bales; Atlantic & Pacific, 3,759 bales. The shipments were 92,196 bales, of which 4,165 bales, or 4½ per cent., went by river, the rest by rail.

—The receipts of cotton at Memphis, Tenn., for the year ending August 31 were: 1874, 429,327 bales; 1873, 414,955 bales; increase, 14,372 bales, or 3½ per cent. Of the receipts very nearly one-half were by rail, the largest amounts being 85,160 bales from the Memphis & Charleston, 59,203 bales from the Mississippi & Tennessee, and 42,693 bales from the Memphis & Little Rock. Shipments for the year were 427,001 bales, of which 37⅝ per cent. went by river and 62⅜ per cent. by rail.

—The shipments of peaches northward through Wilmington, Del., from the commencement of the season up to September 3 were 982 car-loads, or 491,000 baskets.

—The Union Pacific Railroad reports earnings and expenses for July as follows:

	1874.	1873.	Increase.	Decrease.	P. c.
Earnings	$850,142.90	$876,833.39	.....	$26,690.49	3
Expenses	370,080.89	437,182.02	.....	67,101.13	15⅜
Net Earnings	$480,062.01	$439,651.37	$40,410.64	.....	9⅛

For the seven months ending July 31 the report is as follows:

	1874.	1873.	Increase.	Decrease.	P. c.
Earnings	$5,413,775.67	$5,459,809.66	.....	$46,033.99	0⅞
Expenses	2,792,183.61	2,790,096.95	$2,086.66	.....	01-16
Net earn'g	$2.621,592.06	$2.669,712.71	.....	$48,120.65	0⅞

The expenses were 51.58 per cent. of the earnings in 1874, and 48.90 per cent in 1873. The earnings per mile were $5,246 in 1874, and $5,291 in 1873.

—The exports of flour and grain from New York to Great Britain for the year ending with August were 1,044,257 barrels of flour, 30,436,276 bushels of wheat, and 18,993,578 bushels of corn. The wheat exports are a little less than the receipts at either Chicago or Milwaukee.

—The flour and wheat receipts of six Western lake ports and St. Louis for the crop year, ending with August, were:

	Flour. bbls.	Wheat. bush.	Total. bush.
Milwaukee	1,545,558	32,096,068	39,051,079
Chicago	1,774,817	31,539,746	39,526,421
Duluth	212,826	2,637,134	3,590,861
Green Bay	50,397	455,491	682,277
Manitowoc	65,000	.....	292,500
Sheboygan	15,265	420,000	488,692
St. Louis	1,393,720	7,553,091	13,824,631
Total	5,057,583	74,701,530	97,460,662

Milwaukee and Chicago are seen to have almost the equal amounts of traffic in these staples, Chicago leading by less than 2½ per cent. St. Louis's flour receipts was about 80 per cent. of Chicago's and 90 per cent. of Milwaukee's, but its wheat receipts were but 23 per cent. of Milwaukee's and 23½ per cent. of Chicago's. Duluth, which was expected to take most of the Minnesota wheat and some of Wisconsin's, has about an eleventh of the receipts of Chicago and Milwaukee; but its wheat receipts are 35 per cent. of St. Louis's.

—The earnings of the Ohio & Mississippi Railway for August were: 1874, $324,359.70; 1873, $306,560.77; increase, $17,798.93, or 5⅞ per cent.

—The receipts of cotton at New Orleans for the year ending August 31 were: 1874, 1,186,455 bales; 1873, 1,214,039 bales; decrease, 27,584 bales, or 2¼ per cent. The receipts were from the following sources:

	1874.	1873.
Red River, bales	170,852	187,743
Ouachita River	102,827	103,679
Arkansas River	45,936	88,128
Mississippi River and bayous	589,449	592,952
N. O., Jackson & Gt. Northern R. R.	277,391	271,537
Totals	1,186,455	1,214,039

The railroad receipts being 23¾ per cent. of the whole in 1874 and 22⅝ per cent. in 1873. The exports for the year were as follows:

	1874.	1873.
Great Britain, bales	633,520	733,063
Other European countries	512,875	444,074
United States ports	199,603	229,338
Totals	1,345,998	1,406,465

Showing a decrease of 60,467 bales, or 4 5-16 per cent.

—The following companies have thus far reported earnings for August:

	1874.	1873.	Inc.	Dec.	P.c.
Atlantic & Pacific	$459,779	$438,168	$21,611	....	4⅞
Burlington,Ce. Rap.& Minn.	114,316	108,100	6,216	....	5¾
Central Pacific	1,301,000	1,251,622	49,378	....	4
Chic., Milwaukee & St. Paul	704,300	767,871	....	$63,571	8⅛
Cleve., Col., Cin. & Ind	403,175	457,964	....	54,789	12
Illinois Central	768,808	769,748	....	60,940	7⅞
Missou i, Kansas & Texas	289,000	336,823	....	47,823	14⅛
Ohio & Mississippi	324,360	306,561	17,799	....	5⅞
St. L., A. & T. H., main line	113,448	127,777	....	14,329	11⅛
" " " branches	49,998	54,046	....	4,048	7½
St. Louis, Iron. Mt. & Sou	254,230	222,753	31,477	....	14⅛
Toledo, Peoria & Warsaw	67,139	98,169	....	31,030	31⅝

—The shipments of Cumberland coal over the various lines for the eight months ending August 29 were as follows:

	1874.	1873.	Inc. or Dec.	P.c
Baltimore & Ohio	933,567	1,024,738	Dec. 91,171	8⅞
Chesapeake & Ohio Canal	501,138	469,941	Inc. 31,197	6⅝
Bedford Div., Penns. R. R.	55,425	55,963	Dec. 538	1
Totals	1,490,130	1,550,642	Dec 60,512	3⅞

—The shipments of bituminous coal over the lines given for the eight months ending August 29 were as follows:

	1874.	1873.	Inc. or Dec.	P. c.
Huntington & Broad Top	216,370	294,289	Dec. 77,919	26½
Clearfield coal over Tyrone Div., Pa. R. R.	424,313	383,374	Inc. 40,939	10⅝
Pa. & N. Y. (nine months)	220,595	216,702	Inc. 3,893	1⅞
Total	861,278	894,365	Dec. 33,087	3⅞

—The receipts of cotton at Texas ports for the year ending August 51 were as follows:

	Bales.
Galveston	363,402
Indianola	24,664
Eagle Pass	979
Total	389,045

Of the Galveston receipts 234,424 bales (64⅝ per cent.) came by railroad. The shipments were as follows, all by water:

	Bales.
England	202,420
Other European countries	70,984
Mexico	979
United States ports	115,056
Total	389,439

—The anthracite coal tonnage of the lines given (whose year begins December 1), for the nine months ending August 29, was as follows:

	1874.	1873.	Inc. or Dec.	P. c.
Philadelphia & Reading	4,031,460	4,525,578	Dec. 494 118	10⅞
Schuylkill Canal	409,808	474,168	" 64,380	13⅝
Lehigh Valley	2,960,486	3,028,320	" 67,834	2¼
Penna. & New York	517.102	506,483	Inc. 10,619	2⅛
Totals	7,918,856	8,534,569	Dec. 615,713	7 3-16

—Coal receipts at East St. Louis during August were as follows:

	Tons.
Belleville & Southern Illinois	30,600
Illinois & St. Louis	17,940
St. Louis & Southeastern	15,190
Ohio & Mississippi	14,170
Vandalia Line	11,564
Indianapolis & St. Louis	3,694
Cairo & St. Louis	700
Total	93,858

—The earnings of the Central Pacific Railroad for August were: 1874, $1,301,000; 1873, $1,251,622; 1862, $1,271,628; increase, 1874 over 1873, $49,378, or 4 per cent.; increase, 1874 over 1872, $29,372, or 2¼ per cent.

For the eight months ending August 31 the earnings were: 1874, $8,911,903; 1873, $8,791,582; 1872, $8,052,755; increase, 1874 over 1873, $120,321, or 1⅝ per cent.; increase, 1874 over 1872, $738,827, or 9 3-16 per cent.

—The tonnage of anthracite coal over the lines given for the eight months ending August 29 was as follows:

	1874.	1873.	Inc. or Dec.	P. c.
Del. Lack. & Western—				
Northward	484,915	601,630	Dec. 116,715	19⅜
Southward	1,159,028	1,420,490	Dec. 261,462	18⅜
Total	1,643,943	2,022,120	Dec. 378,177	18⅝
Lehigh Div., Central of N. J.	1,660,729	1,800,675	Dec. 139,946	7⅝
Del. & Hud. Canal Co.	1,521,004	1,900,801	Dec. 379,797	20
Pa. Coal Co., by Erie Ry.	846,223	805,609	Inc. 40,614	5
Shamokin Div., Nor. Central	352,631	413,137	Dec. 60,506	14⅝
Summit Branch	310,179	299,447	Inc. 10,732	3⅝
Totals	6,334,709	7,241,789	Dec. 907,080	12½

—The earnings and expenses of the Atlantic & Pacific Railroad and leased lines for the two months of July and August were as follows:

	1874.	1873.	Inc.	Dec.	P. c.
Earnings	$847,137 78	$815,993 59	$31,144 19	.....	3⅞
Expenses	499,114 48	520,428 61	.....	$21,314 13	4⅛
Net earnings	$348,023 30	$295,564 98	$52,458 32	.....	17⅞

The expenses were 58.92 per cent. of earnings in 1874 and 63.78 per cent. in 1873.

OLD AND NEW ROADS.

California Pacific.

A Frankfort journal has published a letter from Mr. C. P. Huntington, Vice-President of the Central Pacific Company and its chief financial officer (written, by the way, as long ago as June), explaining the position of the Central Pacific, or rather of the Central Pacific managers, in relation to the California Pacific, which reads as follows:

"As to the charge of alienating any securities that were pledged for the extension or income bonds, I will say that the charge is false; but, as I understand, that charge was made because the San Francisco & North Pacific Railroad and the Sacramento steamers were sold. The facts in detail are that in April, 1871, the California Pacific Railroad Company bought the San Francisco & North Pacific Railroad for $750,000, paying cash $250,000 and their notes for $500,000. These notes were not paid for the reason that the California Pacific Railroad Company had not the money to pay them. In December, 1872, the California Pacific sold the San Francisco & North Pacific road to the Contract and Finance Company for $750,000. I will state here that after the purchase the road was extended to Cloverdale at a cost of something over $300,000, and then sold to Peter Donahue for $1,050,000, sustaining a loss of a few thousand dollars. This was done because this road did not connect with the California Pacific, and its natural outlet was not over any part of that road.

"In May, 1871, the California Pacific Railroad Company bought the steamers of the California Steam Navigation Company for $800,000, giving notes for the full amount; $450,000 of the notes were unpaid in December, 1872, and the California Pacific Railroad Company sold the steamers to M. S. Latham, in trust for the Central Pacific, for $786,000 (the steamer Chin-Du-Wan having been previously sold for $14,000), which amount the Central Pacific paid to the California Pacific Railroad Company.

"The supposed relation of the California Pacific Railroad to the Central Pacific Railroad is as follows: About three years ago certain parties, a portion of whom were interested in the Central Pacific Railroad, bought a majority of the shares of the California Pacific Company, and at about the same time the Central Pacific Railroad Company guaranteed the payment of $1,600,000 of 6 per cent. 30-year gold bonds, but the Central Pacific Railroad Company has neither leased nor operated the California Pacific road, nor has it in any way assumed or guaranteed either the principal or the interest of any portion of the funded or other debt of the California Pacific Railroad Company, except the $1,600,000 6 per cent. bonds mentioned above, and is neither legally nor morally bound to pay either principal or interest of any other of its securities except those above mentioned.

It may be asked why the Central Pacific Railroad Company had sufficient interest in the California Pacific road to guarantee the payment of $1,600,000 of bonds. The Central Pacific Company was led to believe that the business of the California Pacific would at least pay the interest on the $1,600,000 bonds, as they would be issued under a second mortgage, and would be entitled to have the interest paid next after the $2,250,000 first mortgage bonds.

"A further reason was found in the belief that with the California Pacific road working in harmony with the Central Pacific, each receiving the business that legitimately belonged to them at remunerative rates, the net earnings of the California Pacific would be largely increased. And furthermore, the writer was told when the stock was bought that the road was earning all its interest; but, to put it in a mild way, I will say that the party giving such information was mistaken.

"In the winter of 1871-72 the California Pacific Railroad was badly damaged by the severe flood, the road-bed being washed away in many places. This was particularly the case on the Marquette Branch, between Knight's Landing and Marysville.

When the work of repairing was undertaken, it was found that the road-bed on this part of the line was much below high-water mark on the Sacramento and Yuba rivers, and as it had but very little business, it was decided it would not pay to rebuild it, as it would add but little to the receipts of the company, and would be liable to be washed out in any of the wet winters of California. I think that the California Pacific road has never paid its interest from its earnings since the completion of the Western Pacific.

The earnings of the California Pacific Railroad from September 1, 1871, to January 1, 1874, after paying operating expenses and taxes, have been honestly devoted to paying the interest on the debts of the company, but they have been sufficient to pay only a fraction less than 3 per cent. per annum on all of its interest-bearing debt, or to pay the interest on the first-mortgage bonds of $2,250,000, and say 1 and 21-100 per cent. on the balance of the funded debt, and of course the company has had to borrow the balance. No one needs to be told that such a course cannot be continued for many years. All parties who have loaned the company the money to pay the interest on their bonds up to this time have done it with the expectation that the earnings would be increased so as to enable the company to pay back at least a portion of it, and in time to pay the interest as it accrued.

These advances were of course made by the friends of the road, who very much disliked to have anything in default that they were connected with in any way, but they have now concluded that as the deficiency is so large, it is not prudent to advance the company any more money.

"All that the road can earn over and above the operating expenses and taxes will be paid to the bondholders.

"Some increase of earnings may be looked for, but the increase will be necessarily slow, as there will be a sharp competition between this and other roads and the Sacramento River. But your readers can truly believe that no others regretted the non-payment of the interest on the extension and the income bonds more than the parties that controlled the shares in this company, and if the deficiency had only been a few thousand dollars each six months, it would have been cheerfully paid as a matter of policy; but, as they were neither legally nor morally bound to pay any more than the road could earn, the deficiency was too large to pay as a matter of policy."

This is a clear statement of the relations of the California Pacific to the Central Pacific managers, and the first one we have seen. It agrees with the report of the California Pacific Company, so far as that touched the same matter. The charges made against the Central Pacific managers which we quoted recently were made by a former President of the California Pacific Company, under whose administration the unaccountable Extension bonds were guaranteed.

Rockford, Rock Island & St. Louis.

Mr. H. Osterberg, Chairman of the Committee of German bondholders who have brought suit for foreclosure, requests American bondholders who wish to join in this suit to notify him by the 15th inst., and send a list of the numbers of their bonds. Mr. Osterberg is to be addressed at the offices of the committee's attorneys, Messrs. Evarts, Southmayd & Choate, No. 52 Wall street, New York, and Hon. Lyman Trumbull, Chicago.

The plaintiffs in the Nickerson foreclosure suit, under which Messrs. Cable and Lynde were appointed receivers, claim that there is a distinction between the bonds issued, although all are called first-mortgage bonds. The first bonds, numbered up to 5,000, were issued under a mortgage, dated June 15, 1878, on the first, second and part of the third grand divisions from Rockford to a point opposite Burlington. Another mortgage was executed October 23, 1868, to secure the same bonds and 4,000 more, the latter mortgage covering the whole road. It is now claimed that the last 4,000 bonds, those numbered from 5,001 to 9,000, are really only a second lien on the property named in the first deed.

Holders of bonds numbered under 5,000 are also requested to communicate with Hassler & Co., No. 7 Wall street, New York, who favor the Nickerson party.

The Hoosac Tunnel Line.

It has been decided to lay steel instead of iron rails through the tunnel, and the necessary alteration in the contract has been ratified by the Governor and Council of Massachusetts. November 1 has been fixed on as the date for running the first train through, although the running of regular trains may be delayed a month longer by the time required for the erection of some bridges west of the tunnel. Arrangements will be made with the contractor for the arching to permit the running of a limited number of trains.

The work on the Troy & Greenfield road will begin next week.

New Orleans, Mobile & Texas.

A correspondent takes exception to the statements in an item concerning this road in the number of August 29.

The information as to the sale of the road under foreclosure and the order of the United States Court to put Frank M. Ames in possession was derived from New Orleans daily papers, the assertions in which were explicit. The sale of the road to satisfy the second mortgage given to the State was publicly advertised over the signature of the Governor of Louisiana. If our information was not correct, it was certainly derived from what are usually trustworthy sources.

New York & Oswego Midland.

A special dispatch to the Utica (N. Y.) *Herald* says:

"The Delaware & Hudson Canal Company is to provide money for the rent of the Utica and Rome branches of the Midland Railroad, and those branches are to be put in order and operated by the receivers.

"The pay car will start over the road next Thursday."

This arrangement is probably only a temporary one. It is said that it will require $20,000 to make the repairs immediately needed on the branches.

Receiver Hewitt has been addressing, at Norwich, N. Y., a meeting of assessors of towns along the line of the road. His address as reported by local papers is in substance the same as the circular recently addressed by him to the assessors. He said that the road was entirely unable to pay taxes, as the expenses still exceed the receipts; if taxes are imposed it must result in the withdrawal of the equipment and the closing of the road.

Award of a Contract.

Col. J. N. Macomb, the Engineer Officer in charge, has awarded the contract for the improvement of the channel of the Illinois River, for dredging and construction of dams, ripraps and jetties, to George Williams, of Keokuk, whose bid was $130,000. The appropriation for these improvements by Congress, last winter, was only $75,000, and the work will be carried on only to that extent. The work is in charge of Mr. R. A. Brown, Assistant Engineer under Colonel Macomb. The other bidders were Fox & Howard, of Chicago, who bid $155,000, and Willard Johnson, of Fulton, N. Y., who bid $132,000

United States Contracts.

Sealed proposals will be received by Lieut. Col. C. E. Blunt at his office, No. 120 Pearl Street, Buffalo, N. Y., until September 10, for furnishing materials for, and the construction of a catch sand-pier at Buffalo. Also for materials and labor for repairs of the south end of Buffalo breakwater.

Columbus, McArthur & Gallipolis.

Work on this road is progressing steadily, if not rapidly, and it is hoped that the section from Gallipolis, O., northward to Vinton Station, about 35 miles, will be finished by the close of the year.

Philadelphia & Reading.

Surveys are being made for a line on the west bank of the Schuylkill opposite Reading, Pa., with the intention, it is said, of laying a track on that side of the river over which coal trains can be run without passing through Reading.

The company has commenced the erection of a new bridge over the Wissahickon, on the Norristown Branch. The new bridge is to have six arches, and will be built entirely of Conshohocken stone.

Chicago & Pacific.

This company, it is reported, has secured the rails for the second division, between Elgin and the Rock River at Byron, Ill., 50 miles, which are to be laid directly. It is hoped to have the road open for business to Byron by next January. The company has also begun work on a new passenger house in Chicago at the corner of Chicago avenue and Larrabee street.

Bangor & Bucksport.

Tracklaying is in progress and the road is to be completed by the end of October. It will be operated by the European & North American Company.

Carolina Central.

Mr. H. G. Onderdonk, one of the principal owners of the road, has brought suit against Edward Matthews to compel an accounting for 450 bonds hypothecated to him for the purchase of the road and also for 476 bonds pledged to the State of North Carolina. Mr. Matthews was trustee under the first mortgage of the Wilmington, Charlotte & Rutherford road, and when the mortgage was foreclosed he bid in the property as trustee and organized the Carolina Central Company. It is also alleged that Matthews bid in bonds issued by the new company at very low rates. The validity of the foreclosure and sale and the organization of the new company is among the questions involved in the suit.

Work has been begun on the extension of the Western Division from Buffalo, N. C., west to Shelby.

Union Pacific.

The following statement of the assets, the securities being given at par, has been issued:

Notes receivable	$7,655 66
Cash	225,878 02
Due from U. S. Treasury Department	515,267 12
Colorado Central bonds and stock	1,220,411 00
Utah Central stock	500,000 00
Utah Southern bonds	412,000 00
Omaha Bridge bonds	5,161 35
Union Pacific stock	8,244 13
Atlantic & Pacific Telegraph stock	2,420,080 00
St. Louis, Council Bluffs & Omaha bonds	29,711 31
Douglass and Washington County bonds	170,000 00
Due from Central Pacific Railroad	37,170 71
Due from Utah Northern Railroad	64,301 00
Land Agent and sundry accounts	5,400 00
Land Notes to July 31, 1874	2,675,719 54
11,044,000 acres of land, at $5 per acre	55,220,000 00
Total assets	$63,517,009 86

Some of the securities, of course, are not worth their face nearly, and the land appears to be put at a pretty high average valuation.

Texas & Pacific.

It is stated that work on the Trans-continental Division will be resumed October 1, and the gap between Brookston and Texarkana filled by the close of the year.

Work on the main line, from Dallas westward to Fort Worth, is progressing steadily.

Kankakee & Illinois River.

So much of the road-bed and right of way as lies in Kankakee County, Ill., was sold recently at sheriff's sale for $125, to satisfy a judgment in favor of D. R. Hitt.

Spartanburg & Asheville.

Work on this road, which is a part of the projected direct line from Chicago to Charleston, is to be begun at Spartanburg, S. C., September 10. Preparations have been made for a grand barbecue and mass-meeting on the occasion.

Illinois Central.

The Land Department reports sales for August of 2,048.11 acres construction lands for $14,258.79. Cash collections amounted to $35,646.48.

The Traffic Department makes the following report for August:

	In Illinois, 707 miles.	In Iowa, 402 miles.	Total, 1,109 miles.
Freight	$386,979 00	$85,302 00	$472,281 00
Passengers	98,342 25	42,784 80	141,027 05
Mails	9,671 66	3,059 33	12,730 99
Other sources	80,328 34	2,440 67	82,769 01
Total, August, 1874	$575,221 25	$133,586 80	$703,808 05
Actual earnings, Aug., 1873.	623,187 05	146,560 65	769,747 70

This is a decrease of 7¾ per cent. in Illinois; a decrease of 8⅞ per cent. in Iowa, and a decrease of 7⅝ per cent. in the total earnings.

Pennsylvania.

The report of the Investigating Committee is nearly ready and will be presented to the stockholders at a special meeting which is called for October 3. The committee was appointed at the annual meeting, March 10, and is made up as follows: William A. Stokes, Chairman; A. Loudon Snowden, Secretary; David E. Small, John S. Treck, Wm. C. Longstreth and John H. Wright. The Committee has made a thorough and exhaustive examination of the property, accounts and records of the company, and has prepared a very elaborate report. This report will probably not be made public until the meeting, but it is stated that, while finding fault with some details, it will generally approve of the present management.

Boston & Albany.

The freight house at East Albany, N. Y., took fire on the night of September 8 and was totally destroyed with its contents and 20 loaded freight cars. The estimated loss is $90,000.

The Wisconsin Railroad Law.

The decision of the Wisconsin Supreme Court in the injunction case will, it is announced, not be given till September 15.

Monadnock.

The stockholders of this company met in Petersboro, N. H., September 2, and voted unanimously to ratify the lease of the road to the Boston, Barre & Gardner Company. The terms of the lease have been already given.

Vermont Valley.

In the suit of W. P. Burrall and others against the existing officers of this company, the United States Circuit Court has given a decision in favor of the plaintiffs. The case between the old stockholders and the present management will now be tried again at the next term of the Circuit Court.

Toledo, Peoria & Warsaw.

Holders of dividend scrip of this company are requested to call at the office, No. 80 Broadway, New York, "on a matter of the utmost importance to them."

Chicago & Illinois River.

The grading of this road is nearly finished, the ties are on the ground and the bridging is completed from Joliet to the coal fields. Tracklaying will soon be begun. The rails have been contracted for from the South Chicago rolling mills and an engine is ready at Joliet.

Selma & Gulf.

In the bankruptcy proceedings against this company an appeal has been taken to the United States Circuit Court. The case will come up at the November term of that court.

Rochester, Nunda & Pennsylvania.

Tracklaying is in progress and it is expected that a section of 20 miles, from Mt. Morris, N. Y., southward to the Buffalo Division of the Erie at Swainesville, will be finished by October 1. Ten miles of track through the town of Nunda are already laid.

Bangor & Piscataquis.

The extension from Guilford, Me., west to Abbott is rapidly approaching completion and is to be opened before the season closes.

New Hampshire Railroad Charters.

The following are among the railroads for which charters were passed by the late Legislature of New Hampshire:

The Pemigewasset Valley road is to run from the Boston, Concord & Montreal, in Plymouth, north to Franconia, about 30 miles, with a branch up Mad River. Authorized capital stock, $2,000,000.

The Spicket River road is to extend from the Manchester & Lawrence road in Salem, northward about 10 miles to the Nashua & Rochester in Derry or Hampstead. Authorized capital, $400,000.

The Swift River road is to be built from Conway, westward up the Swift River Valley, into the town of Waterville, in Grafton county, a distance of about fifteen miles. Authorized capital, $500,000.

Kansas City, St. Joseph & Council Bluffs.

Arrangements have been made with the Missouri Pacific by which through express trains are run between Council Bluffs and St. Louis. These trains cross the St. Joseph Bridge and from there run down the west bank of the river on the Missouri Pacific track.

Niagara River Transit Company.

Books have been opened for subscriptions to the stock of this company, which proposes to build a bridge or tunnel across the Niagara River at or near Buffalo.

Minneapolis & St. Louis.

An agreement has been made with the St. Paul & Pacific, which gives this company a perpetual right of way over the St. Paul & Pacific road-bed with the right to lay a track from Minneapolis, Minn., to Cedar Lake under certain conditions, one of which is to pay one-third of the cost of repairs to the roadway.

New Jersey & New York.

This company, which is a consolidation of the Hackensack & New York and Hackensack Extension companies, is offering for sale $500,000 of its first mortgage 7 per cent. gold bonds. The bonds are due in 1893 and are offered at 87½ and accrued interest, and coupons are made payable in New York or London. The company has a road 21 miles long, from Hackensack Junction, N. J., on the Erie, north to Spring Valley, N. Y., which is now operated by the Erie. Work is in progress on an extension of 16 miles from Spring Valley to Haverstraw on a line not very far from that of the Jersey City & Albany, which also purposes extending its road to Haverstraw.

The company proposes making the terminus of the road on the Hudson River just above Hoboken, and to that end intends hereafter to build an extension of about eight miles from the present junction with the Erie to that point, including a tunnel through Bergen Hill.

The capital stock issued is $1,201,880, and the bonds outstanding amount to $565,000. The whole issue of first-mortgage bonds is to be $6,000,000. It will depend on suburban traffic for its support.

Lake Shore & Michigan Southern.

It is reported that this company has made a sale of $2,000,000 of its second-mortgage bonds in London.

Iowa Pacific.

Grading is in progress between Waverly, Ia., and Clarksville, and that section of 10 miles will soon be ready for the rails.

Cairo & Vincennes.

Arrangements have been made for a through express train between Indianapolis and Cairo over this road and the Indianapolis & Vincennes.

Detroit & Milwaukee.

A suit for the foreclosure of a mortgage of $2,500,000 has been begun in the United States Circuit Court at Detroit, Mich.

Chicago & Northwestern.

President Keep has written a letter to Governor Taylor, of Wisconsin, to correct a misstatement made recently by the Governor in a speech at a Grangers' picnic, in which he asserted, giving the Railroad Commissioners as his authority, that compliance with the Potter law would, if business remained the same as last year, reduce the gross earnings of the Northwestern not more than 5 per cent. Mr. Keep asserts that the reduction would be not 5 but 25 per cent. in the gross earnings; and in order that the Commissioners may be satisfied of the truth of his statement he invites them to make a full examination of the books of the company at the office in Chicago.

Ponagansett.

A proposition for the construction of this road has already been made, and the final survey is to be begun at once. The length of the road, from Providence, R. I., west to Danielsonville, Conn., will be about 30 miles.

Connecticut Central.

The engineers are at work on the line and will make the final location of the road. The town committee of Vernon, Conn., has completed the town subscription for 600 shares, which is made on condition that the road shall be completed by Sept. 1, 1876.

Manchester & Camden.

Work on the line from Camden, N. J., east to Medford is shortly to be resumed. A considerable portion of the road-bed between Camden and Marlton, 18 miles, was graded last year.

Meetings.

The annual convention of the Conductors' Life Insurance Association has been postponed from September 3 to October 28, and will be held in St, Louis on the latter date.

The annual meeting of the Western Union Telegraph Company will be held at the company's office in New York, October 14, at 12 noon.

A special meeting of the stockholders of the Pennsylvania Railroad Company will be held in Philadelphia, October 3, to receive the report of the investigating committee of seven appointed at the annual meeting in March.

Baltimore, Pittsburgh & Chicago.

Contracts have been let for the masonry and carpenter work of the new shops at South Chicago. There will be a round-house with 16 stalls, a blacksmith shop and machine shop. Work was begun September 3.

Chicago, Milwaukee & St. Paul.

In consequence of the diminished business of the road an order has been issued cutting down the force of employees in the shops 40 per cent.

Dividends.

The Western Union Telegraph Company has declared a quarterly dividend of 2 per cent., payable October 15. Transfer books will be closed from September 19 to October 16.

Erie.

Mr. Bishop, one of the English accountants who have been engaged for five months past in investigating the accounts and financial condition of the company, sailed for England September 2, and his associate, Mr. Glegg, sailed September 5. It is understood that Mr. Bishop took with him the report which is to be submitted to the English stock and bondholders, on whose account the investigation was made.

An order, which took effect September 1, makes the following changes in the Motive Power Department:

1. Eastern car-shop will include the car-shops at Jersey City and at Newburgh, also all men employed in the car department at other points on the Eastern Division and branches.

2. Port Jervis shop will embrace the machine shop and car repair shop at Port Jervis. The men employed in this department at Hawley, Honesdale, and at other points on the

Delaware Division east of Deposit will report to the Master Mechanic of Port Jervis shop,

3. Susquehanna shop will remain as heretofore, except that all men employed at Deposit, Carbondale and those in the car department at Susquehanna will be subordinate to the Master Mechanic of that shop.

4. Elmira shop will embrace the shops and all men employed in this department at Elmira, together with those at Owego, Waverly and Corning.

5. Rochester shop will embrace the machine shop at Rochester and Avon. All men employed in the department on the Rochester Division and branches will be subordinate to the Master Mechanic of Rochester shop.

6. Jersey City shop, Hornellsville shop and Buffalo machine shop will remain as heretofore, with the exception of the change referred to in paragraph No. 5.

Greenville & Columbia.

The recently-issued annual report of the South Carolina Railroad Company contains the following references to the affairs of this road:

"Proceedings in bankruptcy had been instituted against that company by certain parties in New York. These proceedings, though not in the names, were believed to be in the interests of certain parties of much financial strength, also in New York. Subsequently that belief was confirmed. These parties held a very large amount of the bonds of the Greenville and Columbia Railroad, and it was apprehended, in fact almost ascertained, that it was their purpose, in the event of their success in the bankruptcy case, to purchase the road, in connection with others who earnestly desired the property. Proposals for compromise and settlement of the claims in suit were peremptorily rejected, and notice in reply rendered that a purchase of the securities held by these parties, some of which the Greenville & Columbia Company had refused to acknowledge, at certain prices named by them, could alone procure a withdrawal of the suits in the bankruptcy court, and that the option would be open only for one day. The purchase was required to be by the South Carolina Railroad Company, with its note at six months. After due and careful consideration of the case, and with the strong endorsement in writing of the counsel in charge of the company's interests, who had, from the beginning, indicated the importance of an arrangement with the parties, we accepted their terms and concluded the purchase. The note given to the New York parties has since been paid from loans made here. The Greenville road has promptly paid all interest due, and we hold for our security the large amount of their bonds ($756,055) represented in the statement, until that company, if it be so determined, arranges for a final settlement of the debt. * * * *

"The Greenville & Columbia Railroad, whose purchase by this company has afforded to the whole State such unqualified approbation, continues to furnish cause for lively gratification to us by its annual development of capacities, which need only the stimulus of capital to place it among the most profitable railroad properties of the South; and in this direction was the aid we afforded in making the purchase of the bonds already reported.

"Our best efforts are devoted to the improvement of its physical condition, and all possible aid is given to the transaction of its business. Its debt, which, when it came to us, was a shapeless mass of folly and fraud, has occasioned us constant annoyance and trouble, and forced on us expensive and protracted litigation, has been considerably reduced in amount, but it will occupy yet some time before a satisfactory statement of it can be made up. With a view to the acquisition of means with which to repair and equip the road, the lawful bondholders were addressed with proposals to fund their coupons, due between January, 1872, and July, 1873, in short bonds having ten years to run; said bonds to have the guaranty of the South Carolina Railroad Company, and the coupons surrendered for the new bonds to be held in trust until the bonds were paid. The amount to be funded will not exceed $175,000. Of that amount there had, at last report, been exchanged the sum of $121,930.49."

Lima & Oroyo.

Latest dates from Peru state that this road is approaching completion. The locomotives now reach the bridge of Chaunichaca, 24 Spanish leagues from Lima, and as soon as this bridge is concluded the rails will be laid to the Infiernillo, two leagues further on. Passing this point and leading up to the wonderful tunnel of the Galera, being constructed at the enormous hight of over 15,000 feet above the level of the sea, there is ready for the iron ten leagues of embankment and track, so that of the forty leagues of the line only four are wanting. These are now being prepared by a large number of laborers, and every day new working camps are established. The Galera tunnel is being rapidly pushed forward; of its 1,220 metres of length more than half is already bored, and the drills are busy night and day.

Hamilton & Northwestern.

The surveys are now complete, and the line is located from Hamilton, Ont., northwest to Collingwood, on Georgian Bay. For a considerable distance from Collingwood the line is parallel and close to that of the Northern road.

North Simcoe.

Bonuses of $75,000 have been voted to this road by the townships of Flos and Tiny, Ontario.

Railroads in Chili.

The *Valparaiso and West Coast Mail* says: "The preliminary steps that have been taken for the construction of a new line of railway between Valparaiso and Santiago, via Casablanca and Mellipilla, have, as we anticipated, been crowned with complete success. Many of the landed proprietors have already subscribed handsomely towards the fund for defraying the cost of a survey, and all of them appear to be disposed to cede gratuitously the land required for the line and its accessories. Under such favorable auspices as these there is no room to doubt that this important project will not be carried to a successful termination. On the assembling of Congress next month the Government will apply for powers to order a survey to be made; and next year, at latest, an application will be made for powers to construct the line. The proposed new line of railway between Valparaiso and Santiago is not the only project of the kind on the *tapis*. The idea of constructing a feeder to the Southern line, to branch off at Pelequen, traversing the fertile valley watered by the Cachapoal, has been started, and has been very favorably received."

Forged Securities.

Attention having been called to the alteration of a stock certificate of the Pennsylvania Railroad Company from a small to a large number of shares, an investigation by the attorney of that company disclosed the existence likewise of similar altered certificates of the Philadelphia & Reading, Lehigh Valley, Central of New Jersey, Delaware, Lackawanna & Western and United New Jersey Companies. The altered certificates were found among the securities belonging to the Central Fire Insurance Company of Philadelphia, and, so far as known, a few of the Pennsylvania certificates are the only ones which have got into circulation.

It has thus far been made public that of the Philadelphia & Reading Railroad Company's stock five certificates had been raised; Pennsylvania Railroad Company, five; Lehigh Valley, five; Delaware, Lackawanna & Western, three; Central of New Jersey, three; United Companies of New Jersey, one. Each of these certificates represented only one share, but they were raised separately to either 200 or 300 shares by erasing the name of the original holder, substituting a new one, and altering the number of shares. Of the certificates of the Reading that have been changed, it is ascertained that the sum total will be an excess of over 1,000 shares, of which the difference in market valuation from the original face-worth of the certificates is $55,000. The Lehigh Valley has thus far only discovered two certificates. One of these had been raised to $3,000 and the other to $2,000. The portion thus far raised amounts to $30,000. It is stated by officials of the Pennsylvania Railroad that they have discovered one certificate for one share raised to 500 shares, the market value of the difference being $26,000. This piece of forgery does not compromise any of the railroad companies, as a record of all the original certificates, the numbers of which are still retained in the altered ones, is registered upon the books of the several companies.

Portland & Ogdensburg.

The road is now completed and cars are running to Bemis' Station, N. H., 78 miles from Portland and very near the Crawford Notch in the White Mountains.

Chicago & Canada Southern.

It is stated that arrangements have been made to build at once about 30 miles of road from the present terminus at Fayette, O., west by south to a connection with the Detroit, Eel River & Illinois road. Part of this 30 miles will be a branch of the main line.

New Bedford & Fall River.

In order to avoid some suspicions of irregularity about the former organization, a new company has been formed to build the road from New Bedford, Mass., to Fall River. No municipal aid is to be asked for, and it is said that all the stock has been subscribed. The line now proposed leaves the New Bedford Railroad near that city and runs to Watuppa Narrows in Fall River.

Lee & New Haven.

The commissioners appointed by the last Massachusetts Legislature have been examining the line of the road and taking testimony for their report on the expediency of extending the grant of State aid. The report is to be presented to the next General Court.

Galveston, Harrisburg & San Antonio.

A correspondent writing from Schulenburg, Texas, on the 31st of August, says: "This road, now open to Harwood, is completed 9 miles further, to Luling, on the east side of the San Marcos River, 55 miles from San Antonio. The opening excursion train goes through on the 4th of September. From Columbus westward this road passes through a very beautiful and productive country, which is still very sparsely settled. The cotton crop is large this season, and of superior quality. It is estimated that 130,000 bales will find an outlet to Galveston this fall and winter by this road. The corn crop is also good, and cattle in better condition for market than usual. Luling is 155 miles from Harrisburg and 200 miles from Galveston; its elevation above tidewater is 420 feet.

Peoria & Rock Island.

Mr. Charles L. Frost, trustee under the first mortgage of the Peoria & Rock Island Railroad, gives notice that he does not recommend bondholders to fund their coupons as requested by the company in the circular of August 15. Bondholders are requested to communicate with the trustee, whose address is Box 4,024, New York City.

Intercolonial.

The rails are laid on a section of this road from the junction with the Halifax & St. John line at Moncton, N. B., north by west to the Coal Branch of the Richibucto River, a distance of 28 miles. Further progress has been delayed by the failure of rails to arrive.

Bay Verte Canal.

It is said that the Canadian Government will soon call for tenders for the construction of this canal, which is to extend across the isthmus between Nova Scotia and New Brunswick and connect Chignecto Bay, the northern arm of the Bay of Fundy, with Bay Verte, a bay of the strait which separates Prince Edward's Island from the main land. The canal, which was first projected many years ago, will be about 15 miles long.

Selma, Rome & Dalton.

The foreclosure sale of the section of the road which lies in Georgia has been postponed from September 1 to November 3, by order of the Chancellor.

Boston, Hartford & Erie.

May 17, 1872, a bill was filed in the United States Circuit Court for Massachusetts by Sidney Dillon against the trustees of the Boston, Hartford & Erie Railroad to enforce certain liens on the property. The trustees subsequently put in a demurrer, and the Court has just given a decision sustaining the demurrer, and has made a decree in accordance with the decision.

The trustees' certificates, which were to have been paid September 1, were not paid, and it is now said that notes or bonds bearing 7 per cent. interest and having two years to run will be issued in exchange for the certificates.

It appears to be more than ever uncertain when the New York & New England Company will be prepared to take possession of the road.

Baltimore & Ohio.

The differences between the company and the Baltimore grain merchants have been satisfactorily adjusted by an agreement which provides:

That the Baltimore & Ohio Company establish a telegraph line to the Corn Exchange and furnish an operator; the Corn Exchange furnishing office and desk. They will deliver notices there to receivers of grain of the arrival of cars at Mount Clare at or before 9 o'clock a. m.

The receiver will make arrangements for sampling; then, by telegram to Mount Clare, will order delivery that day or the day following, either to Locust Point or Camden street. If the cars are not unloaded according to this rule by 6 p. m. following, a charge for demurrage of $5 per day will be made.

If notice of arrival at Mount Clare is not delivered on Corn Exchange at or before 9 o'clock a. m., then an additional day be allowed without charge.

These rules to apply to Camden Station also. No charge to be made for telegraphic notice of arrival or order for delivery.

These rules to go into operation as soon as accepted by the trade and necessary arrangements can be perfected.

Considerable improvements are to be made at the Camden Station in Baltimore. The engine-house is being removed from the yard, the passenger platforms are to be extended, and the ticket office removed to a more convenient position in the main building.

Connection is now made with the Richmond, Fredericksburg and Potomac road by way of the East Alexandria Branch and steamboat from East Alexandria to Quantico.

St. Louis, Kansas City & Northern.

A new mortgage for $3,000,000 is to be placed on the road, which will be a first lien on certain real estate at St. Louis, Kansas City, Moberly and other places, and on the eastern extension to connect with the bridge in St. Louis, and a second lien on the rest of the company's property, which is covered by a first mortgage for $6,000,000. The new bonds will bear 7 per cent. interest and have 21 years to run from September 1, 1874. The proceeds are to be used for building the extension and providing better terminal facilities in St. Louis, for building some 10 miles of road from the present junction with the Hannibal & St. Joseph into Kansas City, for other improvements and new equipment.

The company is now offering $2,000,000 of these bonds to its stockholders *pro rata*, at (nominally) par, payable one-half in money and one-half in the preferred stock of the company. The money payments to be made 10 per cent. down, 50 per cent. September 20, and 40 per cent. October 20; stock payments, 50 per cent. September 20, and 50 per cent. October 20. The bonds will be delivered one-half September 28, one-half October 20, with the privilege of paying in full and receiving full amount of bonds any time after September 10.

A Meeting of Railroad Managers.

A meeting was held in Chicago, September 2, at which most of the leading western lines were represented. There was a general discussion which closed by the adoption of the following resolution: "Resolved, that as soon as the Commissioners for the West, appointed at Saratoga, shall put in operation rules and regulations for abolishing commissions for passenger business, for the maintenance of rates, etc., the lines west of Chicago and the Mississippi will heartily unite in a complete overthrow of the said system of paying commissions on passenger business, in the maintenance of rates and in such other reforms as the Commissioners may propose."

Gov. J. D. Cox, of the Toledo, Wabash & Western, presided at the meeting.

New York, New Haven & Hartford.

Prompt and severe punishment for carelessness appears to be the intention of the New York, New Haven & Hartford Company in the case of the driver of a switching engine at Springfield, Mass., who recently ran over a crowded street crossing at great speed and without giving time or warning to the flagman to close the gates, thereby killing one person and injuring two others. The engineer was promptly discharged and the company has since caused him to be indicted for manslaughter. He has been arrested and held for trial, and the design seems to be to make his a sort of test case, as well as a warning to others.

People's Freight Railroad.

A convention in favor of the projected People's Freight Railroad, which is to run from New York to the Mississippi River, met in Mount Vernon, O., September 2. Delegates were present from New Jersey, Pennsylvania, Ohio, Indiana and Illinois. Committees from each State were appointed to secure subscriptions to defray the cost of preliminary surveys of the line, with a central committee, whose headquarters will be in Pittsburgh, Pa., and to which the State committees will report.

Preliminary organizations have already been formed in New Jersey, Pennsylvania and Illinois.

THE SCRAP HEAP.

Uniformity of Gauge in India.

At a general meeting of the Scinde, Punjaub & Delhi Railway Company, held in London on the 30th ult., the Chairman, Mr. W. P. Andrews, "congratulated the shareholders on the fact that the Government had decided to adhere to the standard gauge for the Indus Valley, and he thought that was more important than any observation he could possibly make them, inasmuch as if the break of gauge had been introduced it would have utterly prevented any hope of that great future which he believed awaited the development of the company's system. He pointed out the immense importance of having the same gauge on all the Indian lines, which would not only facilitate the sending of goods from one part to the other, but also enable it to be done at much less cost, inasmuch as there would be no expense in shipping goods from one set of trucks to the harbor."

"Total Disability."

A correspondent of the Chicago *Inter-Ocean*, writing from Rye Beach, says:

"Speaking of accidents reminds me of a character in the neighborhood. It is a farmer, whose legs were broken by an accident on a well-known New England road. A year or two ago he instituted suit against the company for damages. There he was, a man whose bread was dependent on his daily labor, a hopeless cripple, both legs broken, and doomed to crutches for life, he hobbled into the court room and plead himself—a miserable, maimed wreck. Well, the company gave him $10,000.

"I met that man the other afternoon, chasing a refractory cow, and there was never a crutch to be seen, and I think it would please the directors of the railroad to see him climb a stone fence. If his case should be cited as a precedent in similar suits, it would probably militate against the payment of damages."

An Automatic Time Indicator.

The Terre Haute (Ind.) *Journal* gives the following account of an arrangement for recording the time of trains, a specimen of which is now in use on the Terre Haute & Indianapolis road: "In the caboose, attached to one side, is an iron box with a glass front, the key to which is kept by the officers of the line. There is a common clock in the box. A spiral thread is fastened upon one of the axles of the car which turns a wheel over the axle. This communicates its motion to a set of rods, which in turn move another small wheel under the edge of the car, and it again moves a small rod which projects upwards into the iron box and moves a pencil point slowly back and forth over a narrow sheet of paper wound upon a small drum, which is turned at constant speed by the clockwork. The paper is ruled in red lines into small sections, every fourth line the short way being dotted and representing a mile. The movement of the paper being uniform and that of the pencil being regulated by the axle, the diagonal lines traced by the pencil will show the rate of speed at which the train has moved. For instance, if the car has gone a mile in four minutes, the line will cross just four sections in going from one dotted line to the next. If the car is standing still, the pencil is at rest and draws a straight line on the paper. The stations being marked at the proper places on the paper, at the end of the trip the roll will show what rate of speed was made at every part of the road, and where and for how long stops were made."

Prizes at the Chilian Exposition.

At this Exposition, to be held in the fall of 1875, the following special prizes will be awarded:

First. One thousand dollars, in gold, for the best style of narrow-gauge railroad, not exceeding three feet, shown by fixed material and rolling stock, including locomotive and tender sufficient to accommodate and carry 6 to 100 tons up gradients of 1 in 50, with curves of 164 feet radius.

Second. One thousand dollars, in gold, for the best system of measuring and distributing water for purposes of irrigation, in specified or proportional quantities. The invention must be accompanied by the necessary apparatus to demonstrate its applicability to the requirements of Chili.

Third. Five hundred dollars, in gold, for the best exploring drill, adapted to mining operations of coal, iron, copper, silver, gold, etc.

Telegraphing Standard Time.

The following is the manner of giving correct standard time to all the telegraph stations, 255 in number, on the main line

and branches of the Philadelphia & Reading road: At three minutes to 4 o'clock P. M., daily, except Sunday, all business along the line is suspended; and by means of a series of repeaters, all the lines of this company, 36 in number, are arranged so as to be operated and controlled by one operator at the Reading office, who has a chronometer before him, from which the correct time is given. Commencing at three minutes to 4 P. M., the operator says "time" on the lines, which calls the attention of all operators to adjust their clocks, and is continued at short intervals until five seconds to 4, when he opens the circuit. At 4 o'clock he makes one tap; at 15 seconds after 4, two taps; at 30 seconds after 4, three taps; at 45 seconds after 4, four taps, and at one minute after 4, five taps.

Old Engines.

The Lowell (Mass.) *Courier* states that the "Nashville," the oldest locomotive in use on the Boston & Lowell road or its branches, was built in 1847, having therefore been in use 27 years. The "Transport," one of the next oldest engines kept in Lowell, was built in 1854. The "Pawtucket" is now the only engine manufactured at the Lowell Machine Shop in use on the road.

A Traveling Store.

The Indianapolis *News* says: "A. B. Kline & Co., of Anderson, have purchased a novel car from the works of Barney & Smith, at Dayton. It is best described by calling it a dry-goods store on wheels. They have made a contract with the Indianapolis, Bloomington & Western Railroad Company to move the car over the road at so much per mile, and propose to stop over at points along the line and sell goods at wholesale. They have the exclusive privilege of the road, in this line, and if successful will establish other routes."

Mechanical Vibration Retarding Rust.

At the recent meeting of the American Association for the Advancement of Science, Prof. S. S. Haldeman, of Harrisburg, read a paper with the above title, of which the following is a brief abstract:

When railroad bars are piled beside a road they soon become rusted, while those forming the track are but little subject to oxidation; and when a rain of some hours' duration falls upon rails when in a state of rest, as upon Sundays, when trains do not run, they soon exhibit rust. This would seem to indicate that in chemical combination mechanical vibrations may interfere with the molecular arrangement of the elements. The accuracy of these casual observations should, however, be submitted to the test of experiment.

In the discussion which followed this brief communication it was suggested that possibly the oil employed upon locomotives might be more or less spread in a thin film over rails in use, and thus prevent their oxidation. This view was earnestly combatted by other speakers. Prof. Van der Weyde was quite certain that the suggestion of Prof. Haldeman bore reference to a fact in physics. Molecular vibrations tended to prevent rust. A saw hung up, unused, would soon become rusty; if used, would keep bright. This was a general experience with tools.

A Triumphant Trunk.

The Detroit *Free Press* of recent date says: "Saturday morning there came over the Great Western road, on its way west, a trunk which made the hair of the baggage-smashers stand right up. It was thirty-four inches long, three feet wide, and was made of solid boiler iron, an eighth of an inch thick. The handles were of iron riveted on with great bolts, and the lid was fastened down with an immense padlock. On one end of the trunk was painted the words: 'She can stand it!' and on the other, 'More coming!' The railroad men groaned aloud as they walked around 'them trunk' and viewed it from every angle, and two omnibus men, who thought the owner was going to stop over, made tracks out of the depot."

A Troublesome Customer.

On the Buffalo, New York & Philadelphia road recently a horse got upon the track and followed it until he reached a long trestle bridge, which he attempted to cross. He fell, however, and wedged himself so firmly between the ties that it took a wrecking car and a derrick to remove him.

Grasshoppers on the Track.

The St. Joseph (Mo.) *Herald* tells of a train on the St. Joseph & Denver City road which struck a moving column of grasshoppers near Beattie, Neb., and in spite of all efforts to pull through that train was nine hours going 11 miles. Another train on the same road was completely blocked at Seneca and was compelled to wait until they had cleared the track. The *Herald* closes its account of these little affairs by saying: "These stories look a little tough, but they are true." Some seven years ago (perhaps since) trains were stopped by grasshoppers in Iowa. The drivers crush them and become so greased that they slip.

Patent on Pontoon Bridges.

Mr. Lawler, the builder of the successful pontoon bridge over the Mississippi at Prairie du Chien, has obtained a patent for his method of constructing such bridges.

A Singular Accident.

A New Haven paper of recent date says: "As an express train from Boston over the Shore Line was passing a rocky cut near Stony Creek, early Friday morning, the hook end of a long fire-poker which hung out of the engineer's cab caught in a crevice in the rock; the poker struck John Gaffney, fireman, and hurled him out on to the track, fortunately beyond the reach of the wheels. He was picked up in an unconscious condition and taken to New Haven. No bones were broken, but he was severely bruised."

Quebec Harbor Improvements.

The Quebec Harbor Commission being authorized to spend $500,000 in improving the harbor of that city, and desiring to secure plans, offers two prizes to engineers, the first of $5,000 for the best and most approved, and the second of $1,000 for the second best plans, specifications and estimates of cost for the improvements. All necessary information can be obtained either by personal application or by writing to J. B. Martel, Secretary Quebec Harbor Commission, Quebec, Canada.

Big Pumping Engines Wanted.

The Board of Public Works of the City of Chicago advertises for proposals for the construction and erection of two pumping engines with boilers and connections for the Water Works. Each is to be capable of raising 15,000,000 gallons 155 feet high in 24 hours, and must not occupy more than 30 by 50 feet on the floor of the engine-house. They are required to raise 90,000,000 lbs. one foot with 100 lbs. of good anthracite coal; the pressure on the boilers is limited to 60 lbs. per square inch.

Railroad Practice in the German Army.

In an article on the railroad battalion which now forms part of the German Army, the *Militar-Wochenblatt* says that, in order to make the officers and men thoroughly acquainted with all the details of railroad construction, they have been employed by detachments, for several months at a time, on both the Government and private railroads. In the years 1872 and 1873 these detachments laid down on various lines 65 kilometres of rails, and built or enlarged twelve new stations. The battalion has also frequently been called upon to replace rails and bridges which had been damaged in accidents. The sub-officers and men have been trained on the Government railroads as engineers, station-masters, drivers, and telegraphists; but the training of the officers in the details of railroad management has as yet been very incomplete, owing to the difficulty of finding opportunities for employing them on lines used for general traffic. The Minister for War has accordingly directed that the whole construction and management of the new line which is to proceed from Berlin via Zossen to the new practising ground of the Artillery Trials Commission shall be carried out by the officers and men of the battalion. This line will be 47 kilometres long, and is to be ready for traffic about the end of the present year.

ANNUAL REPORTS.

Northern, of New Hampshire.

This company owns a road from Concord, N. H., northwest to White River Junction, 69 miles, with a branch from Franklin (19 miles from Concord) north to Bristol, 13½ miles, making 82½ miles in all.

The property is represented by the following securities:

Stock ($37,193 per mile)	$3,068,400
Bonds ($1,238 per mile)	102,100
Total ($38,431 per mile)	$3,170,500

There is also a contingent fund of $506,190.55, to offset which the company holds 703 shares of its own stock and has $236,343.31 invested in the Sugar River and Concord & Claremont roads.

The operations for the year ending March 31 were as follows:

Earnings:	1874.	1873.
Passengers	$228,778 89	$223,045 39
Freight	453,692 21	457,244 35
Mails, express, etc	25,288 99	21,065 50
Total earnings	$707,760 09	$706 355 24
Operating expenses	473,526 12	489,252 53
Net earnings	$234,23 ! 90	$217,102 71
New rail account	18,426 94	56,038 01
Balance	$215,806 96	$161,064 70
Earnings per mile	$8.579	$8,562
Per cent. of expenses	66.90	69.26

There is an increase this year of 0.2 per cent. in earnings; a decrease of 3.21 per cent. in expenses, and an increase of 7.87 per cent. in net earnings. Two dividends, each of 4 per cent., were paid during the year.

The work of the year was as follows:

	1874.	1873.
Train mileage	477 456	506,848
Passengers carried	199,066	195,406
Passenger mileage	8,177.430	8,06 ,748
Tons of freight carried	382,947	411,888
Tonnage mileage	23,721,128	23,655,830

This shows an increase of 1.45 per cent. in passenger mileage and of 0.28 per cent. in tonnage mileage.

During the year, 609 tons of new rails and 45,537 new sleepers have been placed in the track; and about 3,400 tons of rails have been taken up, repaired, and relaid. One new passenger and also one new freight engine, and one baggage car, have been built and are additions to the furniture of the road. And one passenger and 28 merchandise cars have been built to replace old ones; and the road and its furniture are in good condition.

The equipment at the close of the year consisted of 12 passenger and 17 freight engines; 16 passenger and 7 baggage cars; 412 long and 101 short freight cars, and 19 gravel cars.

The directors deemed it best to borrow the money to pay the bonds falling due April 1, 1874, giving the company's notes payable in three and five years. A full return is expected from the investment in the Concord & Claremont road hereafter.

West Jersey.

This company operates the following lines:

	Miles.
Camden, N. J., to Cape May	81.18
Glassboro to Bridgeton	19.60
Salem Railroad, Elmer to Salem	16.58
Swedesboro Railroad, Woodbury to Swedesboro	10.80
Total	128.16

Of this, 41.35 miles (Cape May to Millville) of the main line, and the Salem and Swedesboro roads are leased, making 59.43 miles owned and 68.73 leased.

The property owned is represented by the following securities:

Stock ($23,218 per mile)	$1,379,750
Funded debt ($40,384 per mile)	2,400,000
Total ($63,602 per mile)	$3,779,750

The annual interest charge is $154,000, or $2,591 per mile owned. The capital accounts of the leased lines are as follows:

	Stock.	Bonds.	Total.
Cape May & Millville	$560,000	$400,000	$900,000
Salem	180,550	100,000	280,550
Swedesboro	93,350	200,000	293,350
Total	$773,900	$700,000	$1,473,900

A total of $21,446 per mile. The West Jersey Company owns $403,000 Cape May & Millville and $70,000 Salem stock and has about $487,000 invested in hotel property at Cape May.

During the year a settlement was effected of the claims against the Cape May & Millville Company by the transfer to the West Jersey Company of $53,000 stock and $400,000 bonds of that company.

The receipts for the year ending December 31, 1873, were as follows:

Passengers	$427,969.66	$416,040.13
Freight	215,415.71	210,·77.07
Mails, express, etc	37,470.86	38,659.94
Total earnings	$680.856.23	$664,777.14
Working expenses	405,129.43	373,413.22
Net earnings	$275,726.80	$291,363.92
Taxes, interest and rentals	178,002.97	180 586.93
Balance	$97,723.83	$110,776.99
Earnings per mile	$5.312	$5,187
Per cent. of expenses	59.53	56.17

There is an increase of $16,079.09, or 2.42 per cent., in earnings; an increase of $31,716.21, or 8.50 per cent., in expenses, and a decrease of $15,637.12, or 5.37 per cent., in net earnings. Two dividends of 4 per cent. each were paid during the year.

The work of the year was as follows:

Passenger train mileage	264,617
Passengers carried	710,435
Passenger mileage	19,107,460
Freight train mileage	94,963
Tons of freight carried	130,115
Tonnage mileage	4,053,772
Mari train mileage	8,067
Tons of marl carried	30,548
" " one mile	454,637

The average receipts per passenger per mile were 2.23 cents; expenses, 1.43 cents; net receipts, 0.80 cent. Average receipts per ton per mile, 5 cents; expenses, 2.92 cents; net receipts, 2.08 cents. Station, terminal and general expenses formed 26.6 per cent. of the cost of passenger service and 2.19 per cent. of that of freight service. The average cost of locomotive service was 31.99 cents per mile run.

During the year 9.55 miles iron rails, 0.03 mile steel rails and 45,157 ties were used in renewals. The gauge was changed from 4 feet 10 inches to 4 feet 9⅛ inches. There are now 14.56 miles of sidings.

The equipment consists of 18 locomotives; 47 passenger and 9 baggage and mail cars; 30 box, 2 stock, 58 platform and 131 dump cars; 26 hand and 17 push cars. The dump cars are largely used in the marl business.

St. Louis, Alton & Terre Haute.

This company owns a main line from Terre Haute, Ind., west by south to East St. Louis, Ill., 195 miles, and a branch from East St. Louis to Belleville, 15 miles, 210 miles in all. It leases the Belleville & Southern Illinois road from Belleville to Du Quoin, 56 miles. The main line is leased to the Indianapolis & St. Louis Company, so that the line actually operated consists of the Belleville Branch and the Belleville & Southern Illinois road, which together form a line 71 miles long from East St. Louis southeast to the Illinois Central at Du Quoin, and part of the shortest existing line from St. Louis to Cairo.

The road owned is represented by the following securities:

Preferred stock	$2,468,400
Common stock	2,300,000
Total stock ($22,707 per mile)	$4,768,400
Bonded debt ($33,333 per mile)	7,000,000
Total ($56,040 per mile)	$11,768,400

The earnings of the main line for the year 1873, as reported by the lessee, were $1,318,652.57 ($6,762 per mile), being a decrease from 1872 of $51,799.02, or 3.65 per cent., which decrease was owing mainly to low rates on through business, though there was some falling off in business the last quarter of the year.

The operations of the line worked for the year ending December 31 were as follows:

	1873.	1872.
Passengers	$136,685 87	.....
Freight	167,113 56	.....
Coal	266,653 67	.....
Other sources	17,031 65	.....
Total earnings	$587,484 75	$507,019 17
Operating expenses	310,846 18	268,004 50
New construction and equipment	18,531 41	19,043 09
Total expenses	$329,377 60	$287,017 59
Net earnings	$258,107 15	$220,001 58
Earnings per mile	$8,274	$7,141
Per cent. of expenses	52.91	52.86

This shows an increase of 15.87 per cent. in gross and of 17.32 per cent. in net earnings. There was a heavy increase the first nine months of the year, partly offset by a decrease for the last three months.

The work done was as follows:

Passengers carried	178,039½
Passenger mileage	3,799,402
Tons freight carried	114,353
Tonnage mileage	4,494,952
Tons coal carried	394,043
Coal tonnage mileage	9,856,314

A summary of the income account for the year is as follows:

Rental of main line	$450,000 00
Net earnings line operated	258,107 15
Interest account	5,323 24
	$713,430 39
Balance from 1872	$17,346 59
Interest account	499,000 00
Rental B. & S. I. R. R.	108,515 73
Sinking fund	25,000 00
Main line expenses, etc.	27,279 12
Profit and loss	30,140 54
	$707,281 98
Balance	$6,148 41

Improvements during the year were 7,470 feet new sidetrack; 31 tons steel, 212 tons steel-headed, 31 tons new iron and 240 tons re-rolled iron used in renewals.

The total locomotive mileage was 384,210 miles, and the average cost 14.2 cents per mile.

During the year two passenger coaches, two box and two coal cars were built. The equipment now consists of 13 engines; 11 passenger and 4 baggage, mail and express cars; 79 box, 15 stock, 30 flat, 452 coal and 3 caboose cars; 1 tool car.

South Carolina.

This company owns and operates the following lines:

	Miles.
Charlestown, S. C., to Augusta, Ga.	137
Branchville, S. C., to Columbia	68
Kingsville, S. C., to Camden	37
Total	242

The property is represented as follows:

Stock ($24,047 per mile)	$5,819,276.00
Bonds ($19,292 per mile)	4,668,645.47
Total ($43,339 per mile)	$10,487,920.47

There is besides a floating debt mainly represented by $363,717.20 bills payable, and $344,775 "special bills payable," these last being on account of settlement made for the Greenville & Columbia Company. As a partial offset, the company has invested in other railroad companies $548,597.25, and in steamship companies $280,447.07. Bonds to the amount of $129.000 have been issued during the year, and $174,295.63 retired.

The equipment of the road consists of 42 locomotives, 23 first-class and 26 second-class passenger cars, 399 box, 14 stock and 117 flat cars. It was increased during the year by two passenger cars, 31 box and 6 flat cars. Two locomotives were built and two purchased, which replaced two broken up and two transferred to the Greenville & Columbia road.

During the year 1,066 tons of rails and 93,025 ties have been used in repairs of track.

The earnings and expenses for the year ending December 31 were as follows:

	1873.	1872.
Passengers	$ 246,756 26	$ 268,042 93
Freight	1,221,239 63	1,110,148 05
Mails	23 020 00	23,020 27
Total earnings	$1,491,015 89	$1,401,211 25
Operating expenses	914,550 57	856,105 61
Net earnings	$576,465 32	$545,105 64
Incidental income	2,210 70	.....
Total net income	$578,676 02	.....
Interest account	417,117 81	.....
Balance, net profit	$16 ,558 21	.....
Gross earnings per mile	6,153 00	$5,790 00
Net " " "	2,382 00	2,253 00
Per cent. of expenses	61.34	61.10

The increase in gross earnings was $89,804.64, or 6.41 per cent.; in expenses $58,444.96, or 6.83 per cent.; and in net earnings, $31,359.68, or 5.75 per cent.

The number of passengers carried one mile was 7,977,480, and the average receipts 3.08 cents per passenger per mile. The tonnage carried was 294,684 tons, the tonnage mileage 33,169,163, and the average receipts per ton per mile, 3.68 cents. The decrease in passenger mileage was 8.21 per cent.

The total engine mileage was 897,530 miles, and the average cost (excluding wages) 12.75 cents per mile.